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Eighteenth Year of Publication

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GENERAL PREFACE

This Year Book is sponsored by the Malayala Manorama, the largest circulated vernacular daily in India. The Manorama family has in recent years expanded to cover periodicals of various types—the Malayala Manorama, a daily, the Manorama Weekly, the Vanitha, a ladies' journal, the Balarama, a children's magazine, both monthlies, the Bhasha Poshini, a highbrow literary bi-monthly and the Manorama Year Book, an annual. All Manorama publications lead in their respective genres. The Daily has crossed the 5-lakh mark — a mark which no other vernacular daily in India has so far reached. Similarly, the Weekly has established a lead, which other weeklies are still striving to equal. The Vanitha is, likewise, the leader among ladies' magazines and Balarama the first among children's magazines.

The latest addition to the family is The Week, an English weekly. With the circulation going up to more than one lakh for the second issue, it promises to keep up the family tradition of being the first in its class.

Our primary object in bringing out this book is to project an updated image of modern India. We have chosen English as the medium so that the book can reach not only the whole of India but also the rest of the world as well. The perspective of the book, however, is not limited to the Indian horizon. It is much wider and covers the entire world — its physical structure and its dynamics, its mosaic of independent states and international organisations, its historical development and cultural evolution, its natural resources and economic problems. Special attention has been paid to Science and Sports for different easons. Science is the cachet of the modern era and Sports the pet topic of the ising generation.

number of assorted topics, many of which turn up in the guise of General Knowledge in competitive examinations and quiz programmes, have been dded, again in the interests of our aspiring youngsters. This has lent an ncyclopaedic colouring to the book which, we hope, is all for the best.

K.M. MATHEW
Editor-in-Chief

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PREFACE TO THE 18th EDITION

This is our eighteenth year. Over the years, the Year Book has been extending its coverage, with the result, that it now comprises a wide variety of topics, ranging from the latest advances in modern sciences to the latest reports on sports and games, both national and international.

Last year, we started a general revision. We now find that there is hardly anything that can be deleted with advantage. On the other hand, there are many new facts which can profitably be added. But limitations of space restrain us from expanding the Sections further except to add new Sections, now and then.

Such an addition this year is 'Renewable Sources of Energy' (Part II), which has now become an urgent question of international importance. Among the new Sections, we may also mention 'Indus Civilization' (Part III) which has been recast as a separate Section under the title 'Beginnings of Indian Polity'.

The Special Feature for the year is Plant Tissue Culture. This is a completely new method of plant propagation which promises to improve both the quality and the quantity of our agricultural production. The main purpose of the Special Feature is to propagate the idea among our educated farmers, who can carry the new technique to the fields and thus lead the way to an agricultural revolution in the country.

We have a kid brother this year, The Week, a weekly in English. English journalism is a hazardous venture for vernacular newspapers. As the first English publication of Manorama, we had to brave the hazards and clear a new trail. The youngster is exploiting this open trail, for all it is worth and bids fair to outshine every other member of the Manorama family.

K.A. Eapen
Editor-in- Charge

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LOOKING BACK ON 1982
National Events

Tailend Omissions

Three events which occurred on Dec. 30 & 31, 1981 were reported only in January, 1982 and were therefore not included in the list of events for 1981 (Looking Back 1981). They are reproduced below and are to be treated as part of the 1981 record.

1981 Dec. 30: Armed bandits shoot 10 harijans dead in Sadhupur village in U.P.

31: The 114-year-old English daily, the Madras Mail, ceases publication. Accord on sharing Ravi-Bias waters between Punjab, Haryana and Rajasthan.

January

Firing on Assam agitators–four killed. Film actor David Abraham dies in Toronto (Jan.1). Dacoits attack Lodhipur Mazra village in Uttar Pradesh: 3 killed, 14 injured (2). Prime Minister announces three-pronged programme to remedy unemployment among scientists at the inauguration of the 69th session of the Indian Science Congress at Manasagangotri, Mysore. National Biotechnology Board announced. Filmotsav '82 inaugurated at Calcutta.(3). Police break up procession in Gauhati, arrest 60 members of All Assam Students Union and All Assam Gana Sangram Parishad. (4). Five leaders of AASU held unde NSA. T.N. promulgates Ordinance for preventive detention. Centre clears three mini-hydel power projects in Tamil Nadu.(5) High Court stays Tamil Nadu Panchayat poll (6). Fake Matric certificates come to light in the Andhra University. (7). Mrs. Anwara Taimur, former Assam Chief Minister, resigns as Congress Legislature Party leader. (9). 21-member Indian team lands on Antarctica. Industrialist B.M. Birla passes away(11). Bombay High Court finds allegations against the Chief Minister A.R. Antulay justified. Antulay resigns Jyotirmoy Bosu CPI(M), M.P. dies in Jaipur(12). K.C. Gogoi sworn in Assam Chief Minister(13). Prime Minister reshuffles cabinet: Pranab Mukherjee gets Finance portfolio; Defence for R. Venkatraman. Prime Minister announces new 20-point plan to gear up economy(15). 30 feared drowned as country boat capsizes in Sasthamcottah Lake near Quilon. Traces of oil found in the second well in Palk straits(16). Countrywide arrests on eve of bandh. India lodges protest with Pakistan against illegal detention and beating of Indian Military attache's chauffeur. Bombay textile workers go on strike(18). Nation-wide strike free from disturbances: Babasaheb Bhosale chosen Maharashtra Chief Minister. IDA loan to be $840 million instead of $1600 million, World Bank management promises to make good the shortfall. Mizo National Front and allied organisations declared illegal by Government (19). 14-member Assam Ministry sworn in (22). 150 reported injured in Nicobar quake. Ragini Devi (85), Classical dancer, dies (23). Telephones celebrate centenary.(24).

Mira Behn gets Padma Vibhushan—15 ministers for Maharashtra sworn in. Curfew in Leh following violence. Mikhail A. Suslov(79) Soviet leader dies(25)

Munder Sharma(66) Congress(I) MP and former Rajasthan Chief Minister dies(26). Sixty-three killed when the Hyderabad-Delhi Dakshin Express and a goods train collide head-on near Delhi IDA scales down lending plans to India for fiscal 1982(27). Seven-member delegation led by Agha Shahi arrives in Delhi for Indo-Pakistan talks on a no-war pact. Bihar Govt. suspends 40 police

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and medical officers in the Bhagalpur blinding case. Spanish King Juan Carlos and Queen Sophia in Madras(29). Billa and Ranga hanged for the murder of the Chopra children(31).

February

Kerala Speaker A.P. Kurian of the CPI(M) and the Deputy Speaker, M.J. Zakaria Sait (AIML) resign and join Opposition. A.C. Jose takes over as Speaker(Feb-1).

Money orders, telegrams cost more, phone rental goes up. Jaisukhlal Hathi (73) veteran Congressman and parliamentarian dies(2). President, N. Sanjiva Reddi arrives at Anuradhapura (Sri Lanka). Statue of Bahubali consecrated at Dharmastala(3). Kerala UDF Ministry headed by K. Karunakaran survives no-confidence motion(4). DA arrears to Central Government employees to be impounded by transfer to Provident Fund accounts(6). International Congress of Soil Sciences opens(8). Assembly elections in West Bengal announced to be held after the second week of April(9). Swedish Prime Minister Thorbjorn Falldin in New Delhi(10). Swedish Prime Minister starts forestry project in Tamil Nadu(13). Cut in US economic assistance over fiscal 1983 to India(14). Assembly adjourns sine die in AP; Dusk to dawn curfew in Sholapur and Pune(15).

P.V. Narasimha Rao returns after a visit to Vietnam and Thailand. Anjiah announces decision to quit as AP Chief Minister(16). Tamil Nadu Assembly: IPC amendment Bill on scurrilous writings passed(17). Lok Dal, Democratic Socialist Party boycott President's address to the joint session of Parliament. Tamil Nadu passes Preventive Detention Bill(18). Sivaji Ganesan, Tamil film actor, nominated to Rajya Sabha (19).

Tanzanian President Julius Nyerere in Delhi (21). B. Venkataram to succeed Anjiah as Andhra Pradesh Chief Minister(22). High Court orders continuation of Bengal poll stay (25). Central Budget: Massive tax effort to raise Rs. 590 crores. Major share from excise and customs(27). Prince Philip, Duke of Edinburgh, in New Delhi(28).

March

Air Chief Marshal H. Latif appointed Maharashtra Governor. Admiral Dawson takes over as Chief of Naval Staff(March 1). Prime Minister inaugurates long bridge linking north Bihar with Patna. Six killed in police firing in Mandaikadu near Nagercoil(2). Advocates boycott courts in Bangalore protesting against alleged assault on one of their colleagues by the Assistant Commissioner of Police. Supreme Court demands apology from a senior counsel, A.K. Sen, and four other advocates in the West Bengal electoral rolls case(3). Supreme Court vacates stay in West Bengal electoral rolls case; A.K. Sen and four others apologise to court(4). Karnataka advocates end stir on police officer's apology to Advocates Association President(6). Assam Ministry expanded (8). Press Council reconstituted. Government announces two grassroots refineries at Karnal and Mangalore. Dhanvantri award presented to Dr. Barnard, reputed heart surgeon(9). The Danish Foreign Minister Kjeld Oleson in New Delhi(11). K.P.N. Singh sworn-in Chief Justice of Madras High Court(12). SP, 13 dacoits killed in UP in an encounter(13). National Development Council Meeting approves of the Prime Minister's 20-point programme (14). Judicial probe into police firing at Mandaikadu (Kanyakumari) ordered. Kerala Congress Mani group member withdraws support: crisis in Government(15). Major rock burst in Kolar Gold fields damages houses. Bhutan King Jigme Singye Wangchuck delivers convocation address of Nagarjuna University(16). President's rule in Kerala: Assembly dissolved(17). President's rule in Assam also: Assembly dissolved. Acharya J.B. Kripalani (94) dead (19). Fifty-nine passengers in a tourist bus die when the vehicle runs into Jayanti Janata Express at an unmanned railway crossing near Kolanur railway station, 60 km from Warangal. C.P.S. Singh, Allahabad High Court Judge and elder brother of V.P. Singh, U.P. Chief Minister, shot dead in a hold-up in Banda district(20). At Nagercoil, a country bomb explodes in the house of a member

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of the district peace committee. N.T. Rama Rao, film artiste, forms new party Telugu Desam in Andhra Pradesh(21). Prof. K.M. Chandy appointed Pondicherry Lt. Governor(22). Maharashtra MLC, Anna Saheb Patil (49) kills himself(23). Prime Minister Mrs. Gandhi leaves London for New Delhi(26). Rajya Sabha biennial election: Congress (I) wins all the seats in Karnataka, Left front wins in Bengal(27). Mrs. Maneka Gandhi inaugurates Lucknow youth convention(28). Rajya Sabha polls: Congress(S) overall size dwindles to five: Congress(I) sweeps in Rajasthan (29). The first Indian-assembled Jaguar aircraft by HAL, Bangalore test flown. P.V. Narasimha Rao leaves for Cyprus on three-day official tour(31).

April

Informal control on steel prices withdrawn(April 1). Six Indians in Pakistan jail lose sight(4). Import licensing made liberal and simpler; duty exemption for export units extended(5). Poll in four States and Garhwal re-election on May 19 announced(7). The President of Mozambique Samora Machel arrives in New Delhi on a five-day official visit. RBI modifies credit policy. Cash reserve ratio for banks reduced from 7.75 per cent to five per cent. Massive multipurpose Thein dam project on river Ravi near Pathankot cleared(8). Record output of oil from Bombay High(9). India's satellite INSAT-IA placed in orbit: Snag detected (10). Jnanpeeth award for Amrita Preetham, Punjabi writer(11). Dr. Chenna Reddy appointed Punjab Governor(12). Kannada writers issue ultimatum that if the Karnataka State Government does not announce its decision on Gokak Committee report by April 20, they would boycott the world Kannada Conference. Former Bihar Chief Minister B.P. Mandal dies(13). 22 killed in bus smash near Tirunelveli(14). Procurement price for wheat fixed at Rs. 142 per quintal, up by Rs. 12 over the existing price. Narayanswami Naidu, President of Tamil Nadu Agriculturists Association, arrested for defying ban order in Madras. Probe on into the discovery of nine IAF rockets in a railway wagon within Bokaro steel plant compound(15). Two killed and four injured in police firing in Chitradurga, as the agitation on Gokak report turns violent(17). Karnataka Government rejects Gokak recommendation that Kannada be the sole first language. Modified three-language formula suggested. State level Action Committee rejects Government decision. Haryana, Himachal Pradesh Assemblies dissolved (19). Violence continues in Bangalore and Dharwar on Kannada issue: Call for Bandh (20). Partial response to bandh call in Bangalore. INSAT-IA moves to parking slot (21). Space scientists free jammed C-Band antenna of INSAT-IA. Algerian President, Mr. Chadli Benjedid arrives on a three-day visit on his way to China, Nepal King Birendra on a two-day private visit in Delhi(22). President inaugurates centenary celebrations of the erstwhile Mysore Representative Assembly(23). Riot in Amritsar: One killed in police fire: Curfew clamped(27). Prime Minister puts off visit to the U.S. and the USSR in view of Presidential election. Violence in Amritsar: Crowd teargassed(28). Karnataka PCC(S) led by Devaraj Urs severs link with parent body the AICC(S) and forms a regional party(28). Visiting Iranian Foreign Minister Velayati says Iran keen on closer ties with India(29). 17 Margis killed in mob fury in Calcutta. Nuclear Fuel Complex (NFC) to double fuel production. Police firing in Patiala(30).

May

Dal Khalsa and National Council of Khalistan banned under the Unlawful Activities Prevention Act 1967 (May 1). Urs' aides join Cong. (I) (2). Mrs. Accamma Varkey (73), freedom fighter and Cong. MLA in former Travancore Cochin Assembly, dies (5). 1982 Kalinga prize for popular science awarded to Venezuelan science journalist Apristides Bastida (9) Karnataka Kranti Ranga led by Devaraj Urs comes into bein (10). French Government offer build factory to manufac electronic exchange equip accepted. Normality resto

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Punjab cities. Election Commissioner, S.L. Shakdher, suggests more police for Bengal (11). Banking department in Ministry of Finance revived (13). UK consortium closes Pradeep plant deal. Supreme Court directs release of eight insane prisoners of the Mazari Bagh Central Jail, Bihar (14). Two Opposition candidates in West Bengal disappear (15). Campaigning for mini-general election ends (17). Another candidate missing in Bengal. Polling peaceful overall. 75 per cent polling in Kerala. Independents hold the key in Haryana. Elections for Assemblies held in West Bengal, Haryana, Himachal Pradesh and Kerala. Jyoti Basu is West Bengal CM, Karunakaran in Kerala, Bhajan Lal in Haryana and Ram Lal in H.P.) (19). Congress(I) Front wins in Kerala (20). Bengal Left Front gets absolute majority. Cargo handling at Tuticorin major port and extension port at a standstill following strike by boatmen and cargo handling labour (21). H. N. Bahuguna, President, Democratic Socialist party, re-elected to Lok Sabha from Garhwal constituency (22). Bhajan Lal sworn in Haryana Chief Minister (23). Attempt to blow up Delhi supermarket foiled (25). Six independents in Haryana cabinet (27). Cabinet approves Defence Minister's recommendation to set up the proposed Naval Academy at Ezhimala near Cannanore, Kerala (29). The Prime Minister's emissary K. Natwar Singh delivers letter from the Prime Minister to President Zia of Pakistan on India's readiness for mutually beneficial relationship (31).

June

Top Bihar officials transferred (June 1). Centre takes serious view of Sheikh Abdullah's attempts to give communal twist to Governor's refusal to give assent to the controversial Bill permitting Kashmir-Muslims who had migrated to Pakistan to resettle in the State (2). 8 killed, 25 injured in a goods train—suburban electric train collision near Gummidipoondi station, T. Nadu. Curfew clamped on the Phulwarisharif township on the outskirts of Patna, as violence erupted amidst arson and explosion. Over 50 killed as cyclonic storm hits Paradeep coast (3). First Secretary of Kuwaiti Embassy in India, Mustafa-al-Marzook, shot dead by a 30-year-old foreigner in South Delhi (4). Delhi police seek interpol aid to probe the killing of Mustafa-al-Marzook. Oil production in Bombay High offshore oilfields registers record level of 251,000 barrels (5). D. Devaraj Urs, former Karnataka Chief Minister, dies (6). Division Bench of the Bombay High Court dismisses appeal filed by former Maharashtra Chief Minister, A.R. Antulay against the finding holding Antulay guilty of arbitrary allotment of cement (10). Five Harijans murdered by violent mob attacking Ayyapuram village three km from Puliangudi in Tirunelveli district, T. Nadu (11). Congress(I) high command directs Antulay former Chief Minister of Maharashtra to resign as chairman of the Indira Gandhi Pratibha Pratishthan (14). Second Rameshwarda Birla Smarak Kosh national award of Rs. 1 lakh goes to Prof. G. Talwar, Director, National Institute of Immunology, New Delhi (15). R. K. Trivedi, Central Vigilance Commissioner, new Chief Election Commissioner (16). Dacoit Malkhan Singh along with 19 men of his gang surrender to Madhya Pradesh Chief Minister, Arjun Singh (17). 19 persons killed and 25 injured in an Air India Boeing 707 from Singapore via Madras, crash at Bombay. Hiren Mukherjee's name not in voters list. Justic H. R. Khanna, former judge of the Supreme Court Opposition nominee for presidency (22). Attempt on the life of the Maharashtra Chief Minister Babasaheb Bhosale Unanimous vote in Karnataka legislature, Kannada to be sole first language (24). Good deposit of oil struck at Enuguvani Lanka in Razole structure of Godavari onshore (27). U.P. Chief Minister, V. P. Singh resigns reacting sharply to massacre of 16 villagers, 10 in Kanpur district and six in Manipur by dacoit gang. Indo-Pak Joint Commission proposed (28).

July

MGR inaugurates Tamil Nadu's nutritious noon meal programme benefitting an estimated 63 lakh poor children (July 1). Entire

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Kolar Gold Field rocked as two wagon-loads of explosives are destroyed in an open area (3). Indian Airlines technicians call off two-day strike following mediation by Maharashtra Labour Commissioner (4). Bihar Assembly Speaker Radhanandan Jha suspends entire Opposition for five days and gets each one of the 77 MLAs physically removed from the House (5). 21 more Bihar MLAs suspended from House. S. Bangarappa (Cong. I) MLA and former PCC(I) President, quits ruling party. Handling of general cargo at Madras Port comes to a standstill, following shore workers joining the six-day strike by marine crew (6). Israeli Consul in Bombay, Yosef Hasseen expelled from India. Katherine Mary Hellman (82), a close associate of Mahatma Gandhi and popularly known as Sarla Behn, dies (8). Cong. (I) candidate Zail Singh declared elected President (15). 100 coal miners killed in Hazaribagh district (16). Dr. N. Veeraraghavan, Voluntary Health Services, Adyar, develops synthetic medium to grow leprosy bacillus (17). 26-member new UP ministry headed by Sripat Mishra sworn in Sukur Narain Bakhia, alleged sumggler who escaped from Fort Aguada jail in Panaji on May 30, appears before the Deputy Superintendent of Police in Daman, in response to an order from a Panaji court. 10 Indians fly home to freedom after eight years in Pakistani jails. Mira Behn (90), disciple of Mahatma Gandhi, dies (20). Zail Singh sworn in President (25). Total annual plan outlay for 1982-83, Rs. 21,082 crores. Film Actor Amitabh Bachchan injured while shooting for a film in Bangalore (26). Mrs. Indira Gandhi in U.S. In disagreement with the Ruling of the Rajya Sabha Chairman M. Hidayatullah, the Speaker Balram Jakher affirms the complete equality of members of the Lok Sabha and the Rajya Sabha in Parliamentary Committees. Petroleum Minister P. Shiva Shanker tells Parliament that the controversial Kuo Oil deal file was 'mislaid' by the Special Assistant to the Prime Minister (28). Third 210 MW unit of the Tuticorin Thermal Power Station (TTPS) dedicated to the nation (29). Manibhai Bhimbai Desai, social worker in Pune, awarded the Magsaysay Award for Public Service for 1982. Naval air station to be set up at Arkonam, near Madras. Bill to impose curbs on press hustled through the Bihar Assembly amidst uproarious scenes (31).

August

One person killed when police opened fire on Kannada film fans who turned violent. Indian Air Force sets up panel of eight to 10 ace pilots to participate in an Indo-Soviet Space flight (August 1). Fire breaks out in the Bombay High offshore oil well where a blow out occurred a few days earlier (2). Indian Airlines Boeing 737, from New Delhi on its scheduled fight to Srinagar, hijacked; drama ends four hours later with the hijacker Gurbax Singh, suspected to be a Khalistan supporter, being overpowered, all passengers safe. Chand Prasad Bhatt, Indian environmentalist, gets Magsaysay award for Community Leadership (4). Bombay High oil well fire off, but blow out persists (5). Prime Minister back in Delhi after nine-day goodwill visit to the U.S. S. K. Pottekkatt, (69) writer, Jnanpeeth award winner and former M.P., dies (6). French Foreign Minister, Claude Cheysson in Delhi (7). Split in Lok Dal formalised with the election of former Bihar Chief Minister Karpoori Thakur as president of the faction opposed to Charan Singh (9). The Speaker of the Iranian Majlis, Hojatoleslam Al Akbar Hashehmi Rafsanjani, a confidant of Ayatollah Khomeini in Delhi. D. S. Manmohan Singh, Member, Secretary; Planning Commission, appointed Governor of Reserve Bank (10). Foreign Secretaries of India and Pakistan conclude two days of talks on bilateral matters. Arun Shourie, named for the 1982 Magsaysay Award for journalism, literature and creative communication arts (12). Air Chief Marshal P. C. Lal (66), former Chief of the Air Staff, dies (13). Foreign Minister of Mongolia Mangalyn Dugersuren in Delhi (14). Investment of Rs 269 crores with a foreign exchange component of Rs. 89 crores approved for the Maruti

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project in collaboration with Suzuki Motor Company of Japan (17). Shoot-at-sight as curfew fails to curb violence. Army moves in on Bombay policemen's revolt. Maharashtra Government sets up committee to look into pending demands and grievances of policemen in State. The Jammu and Kashmir Governor B. K. Nehru accepts resignation of G. M. Shah, the State's Works and Power Minister and son-in-law of the Chief Minister Sheikh Abdullah (18). Ramachandra Balwant Ghorpade (82), freedom fighter, educationist, journalist and former legislator, dies (19). Desperado, who had given his name as Museebat Singh and who tried to hijack an Indian Airlines plane to Lahore, shot dead at Amritsar. Curfew off in Bombay. India buys 2.5 million tonnes of wheat in the U.S. (20). Agitation by journalists in Bihar against Bihar Press Bill takes serious turn with over 30 demonstrating newsmen being injured in a lathi charge (21). Haryana Government dismisses 293 men of the State Police Force (24). Punjab Police arrest 266 activists of the Akali Dal (Longowal group) as a prelude to an all embracing drive against Sikh extremists. Japanese Foreign Minister Yoshio Sakurauchi arrives on three-day visit to India. Maa Anandmay (88), mystic, dies (27). Japan to provide loans and grants worth Rs. 126.93 crores to India for five projects during 1982-83 (28). Former Vice President G. S. Pathak dies (31).

September

Eight new Ministers announced in a Central Cabinet reshuffle-cum-expansion. Supreme Court directs interview of an undertrial in Dharbanga jail who has spent 37 years as an undertrial in one prison or other in Bihar (Sept. 2). Sixty die after consuming adulterated liquor at Vypeen island in Cochin (4). INSAT-IA turned off as it is "beyond redemption" (5). Jammu and Kashmir Chief Minister Sheikh Abdullah (77) dies (7). Oil struck in Porto Novo, 40 km from Pondicherry. Tamil Nadu receives first Nadezhola K. Krupskaya Prize from UNESCO for meritorious work in adult education (8). Earth stations at Delhi, Madras, Port Blair, Aizawl and Leh put into operation through Intelsat (10). Malayalam film, 'Oridathoru Phayalwan' bags best film award in Asian film festival (15). The Karnataka Vigilance Commission detects 11 cases of students securing admissions to engineering coleges in the merit pool by altering marks cards and other malpractices (18). Prime Minister Mrs. Indira Gandhi leaves for Moscow. Prime Minister discloses the names of the two IAF test pilots (Wing Commander R. Malhotra and Sqn. Leader R. Sharma) selected to participate in the Indo-Soviet joint space flight in 1984 (20). Major fire breaks out in oil well near Baroda (27). Mrs. Thatcher flies into Delhi from Hong Kong (28). Fire in Dabka oil well near Baroda is put out. Zail Singh leaves for Houston, USA, for medical check-up. Shoot-at-sight orders in Meerut following mob violence (30).

October

Former Finance Minister C. D. Deshmukh dies (October 2). Mrs. Gandhi expresses herself against Jammu and Kashmir Resettlement Bill. Three die in renewed violence in Meerut (3). President refers J & K Resettlement Bill to Supreme Court (5). Chief Martial Law Administrator of Bangladesh Lt. Gen. H. M. Ershad arrives in New Delhi (6). India and Bangladesh decide on a two-year extension of the Farakka agreement of 1977 pending long term arrangement to augment the lean season flows of the Ganga. India leases Tin Bigha to Bangladesh, the sovereignty resting with India (7). The Air Force celebrates 50 years (8). H. V. Kamath, freedom fighter and parliamentarian, dies (9). Hindus, Muslims and Christians offer special prayers for rain in Madras (10). Four die as police open fire to control mob of irate Sikhs, which turns violent near Parliament House. Police resort to firing and lathi-charge in Bombay to quell violence by agitators who launch a three-day 'stop production' and 'pack jails' stir in response to call by Dr Datta Samant. Union Government announces cut in customs duty on imported colour TV sets (11). RBI emphasises that there is

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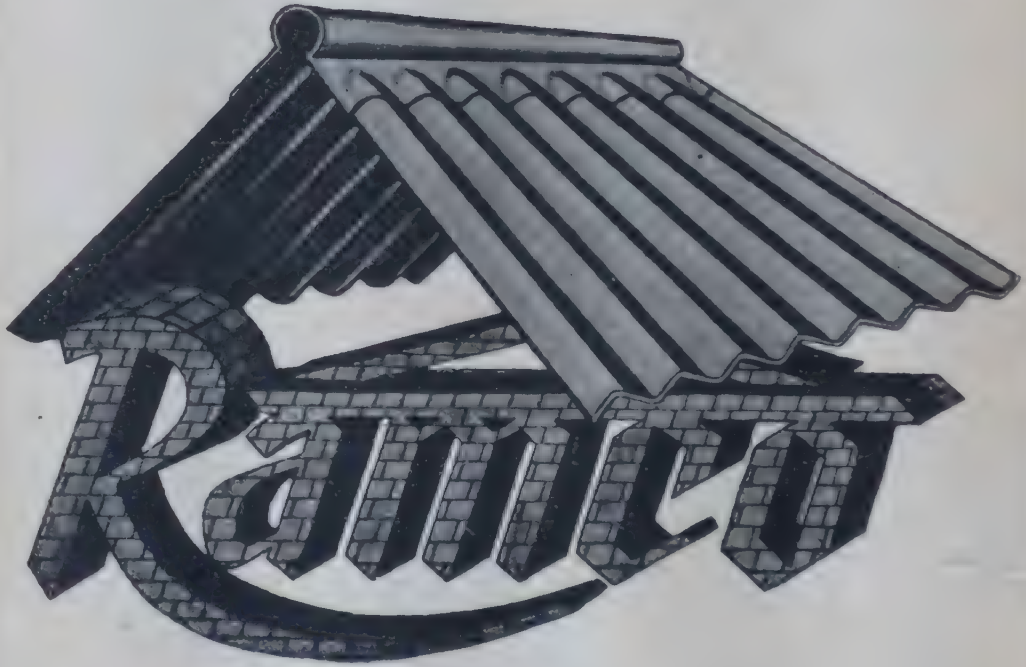

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no generalised recession in Indian economy (13). Mrs. Gandhi reaffirms in the Rajya Sabha that the Centre does not want to impose Hindi on anyone. J. L. Kapur, freedom fighter and former Supreme Court Judge, dies (14). A 10-hour hartal called by the ruling AIADMK and other parties in Tamil Nadu to focus attention on Cauvery waters issue, ends peacefully. J. R. D. Tata, father of Indian civil aviation, pilots the De Havilland Leopard Moth from Karachi to Bombay—a feat he performed 50 years ago (15). Cyclone claims five lives in Nellore (AP) and disrupts road and rail services (18). Textile strike in Bombay enters second year. Journalists and non-journalists from all over the country stage a march to Parliament demanding withdrawal of the Bihar 'anti-press' Bill (21). Prime Minister's emissary Mrs. Swaran Singh meets Akali leaders in Amritsar to pave the way for a direct dialogue with the Centre on their demands (22). RBI announces relaxation in credit availability to vital productive sectors of economy and for export (25). Violence in Amritsar leaves four dead (26). Troops patrol Baroda following mob violence during Muharram procession which leaves five dead and injures 29. Gandhiji's private secretary Pyare Lal dies (27).

November

Gen. Zia-ul-Haq of Pakistan in New Delhi. Agreement to set up a joint commission. On the sixth day of disturbances in Baroda, one person stabbed fatally. Riots begin in Goan town of Vasco following stoning of a procession of non-Goan casual workers led by Goa Garib Mazdoor Samithi. (November 1). Ravi L. Kirloskar, (65) industrialist, dies (4). Following exodus of labourers, mostly Kannada-speaking Goans into Karnataka, Chief Minister, R. Gundu Rao sends urgent message to Goa CM urging him to ensure full protection to the workers of Karnataka origin in Goa. Storm leaves a trail of havoc in Gujarat, killing more than 300 persons (8). Proposal is made for a Central law banning advertisements of baby food, as a substitute for breast milk (9). Goa Revenue, Cooperation and Power Minister Sheikh Hassan meets Karnataka CM in Bangalore and promises all assistance to Kannadigas who have fled Goa to return. Tamil Nadu launches free toothpowder distribution scheme for rural children (11). Noon-meal scheme is launched in Andhra Pradesh. C. Narayana Pillai (80), freedom fighter, Chief Editor of Kerala Pathrika and a former Rajya Sabha member, dies in Trivandrum (14). Acharya Vinobha Bhave (88) dies (15). Well known diplomat K.P.S. Menon (84) dies (21). More than a dozen huts burnt down in a fresh wave of arson in Vasco town of Goa (24). French President, Francois Mitterand in New Delhi. Agreement on nuclear fuel supply (27). CPI-M leader Promod Das Gupa dies (29). Egyptian President, Hosni Mubarak in New Delhi and welcomes various initiatives under way for a settlement of Arab-Israeli conflict (30).

December

India and Egypt agree to set up joint committee at ministerial level to ensure accelerated cooperation in various fields. The 28-member second Antarctica expedition team leaves by m.v. Polar Circle, a chartered Norwegian Ship, from Mormugao Port, Goa (December 1). Train accident near Manoharpur, 40 km from Rourkela, leaves nine dead and 29 injured (2). Bishnu Dey (72) poet and winner of the Jnanpeeth literary award for 1971 dies (3). The Union Government approves massive investment programme of Rs. 499 crores to step up production and distribution of cooking gas (LPG). Bihar Government decides to amend the controversial Press Bill (7). Rajasthan Chief Minister S. C. Mathur says the State Government will oppose any reopening of the 1981 agreement on Ravi-Beas waters. China accuses India of using Asian Games to spread a 'discreditable' claim to Arunachal Pradesh (10). Planning Commission sets up 20-member advisory committee of experts to develop the Himalayan region on systematic and scientific lines. Union Government decides to cancel visit of three-member delegation to China to take part

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in Kotnis memorial function, following insinuations that India has misused Asiad forum (11). Congress led by A. K. Antony merges with Congress-I in Mrs. Gandhi's presence (13) Manoranjan Guha, journalist and freedom fighter, dies (16). India and Pakistan agree to set up ministerial level joint commission (23). Cold wave in Bihar, over 50 persons die (28). Police and Nabi-Day processionists clash at Alleppey in Kerala. One killed in police firing. Many policemen injured (29). Echoes of the Alleppey clash at Karamana, Trivandrum and other places. At Karamana a man was burnt to death in a house set on fire by the crowd. In Trivandrum, Chalai, the main shopping centre of the capital, many shops were burnt down and looted (31)

State Elections 1983

In 1983 three States, Andhra Pradesh, Karnataka and Tripura held elections on 5th January The election results upset the Congress(I) applecart in the south.

Andhra Pradesh

Party position in dissolved Assembly

Congress(I)	246
C.P.I.	6
C.P.I.(M)	8
Janata	5
Lok Dal	6
B.J.P.	3
Others	10
Vacant	10
Total seats	294

Results of the 1983 Election—partywise

Telugu Desam	201
Congress(I)	60
C.P.I.	4
C.P.I.(M)	5
B.J.P.	3
Janata	1
Congress(J)	1
Independents	18
Countermanded	1
Total seats	294

Karnataka

Party position in the dissolved Assembly

Congress(I)	184
C.P.I.	3
Congress(O) & Kranti Ranga	6
Janata	12
B.J.P.	4
M. League	1
Others	10
Vacant	4
Total seats	224

Results of the 1983 Election—partywise

Janata-Ranga front including CPI 3 and C.P.I.(M) (2)	101
Congress(I)	81
B.J.P.	18
Maharashtra Ekikaran Samity	5
A.I.A.D.M.K.	1
Others (including one C.P.I.(M) candidate who contested as an independent)	17
Countermanded	1
Total seats	224

Delhi election 1983

Party position

Metropolitan Council

Total seats	56
Results declared	56
Congress(I)	34
BJP	19
Lok Dal	2
Janata	1

Municipal Corporation

Total seats	100
Seats declared	94
Congress(I)	55
BJP	34
Lok Dal(C)	3
Janata	1
Independent	1

Tripura

Results of the 1983 Election—partywise

C.P.I.(M)	37
R.S.P.	2
Congress(I)	12
Ind. (rebel Cong.I)	3
TUJS*	6
Total seats	60

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*Tripura Upajati Juba Samiti

Tripura

The demographic profile

Year	*Tribals*	*Non-tribals*	*Total*
1874	42,345	31,897	74,242
1901	91,544	81,781	1,73,325
1931	1,90,032	1,92,418	3,82,450
1961	3,60,070	7,81,935	11,42,005
1971	4,50,544	11,05,798	15,56,342

Source: Census reports

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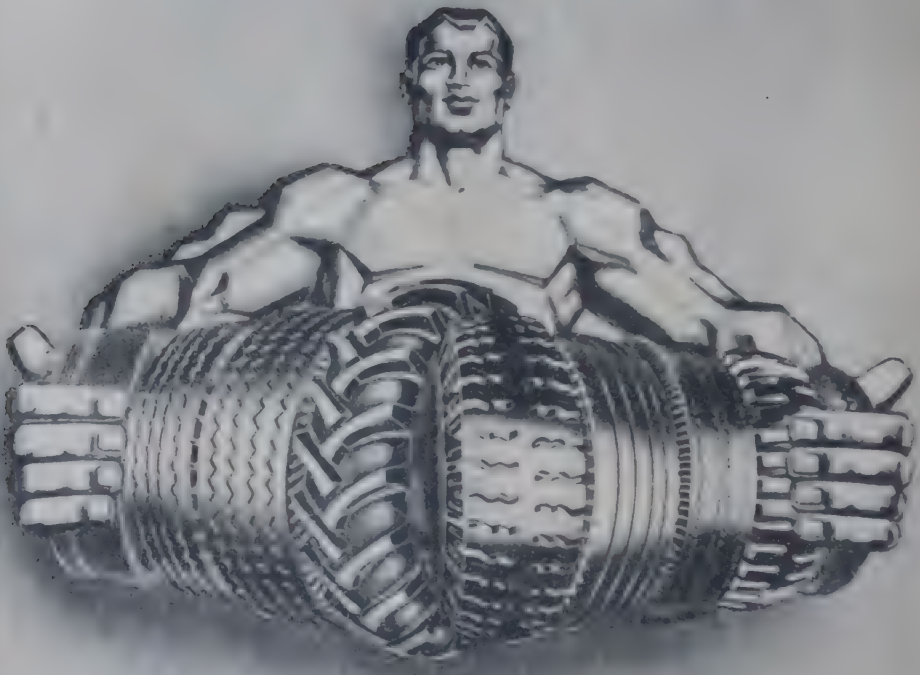

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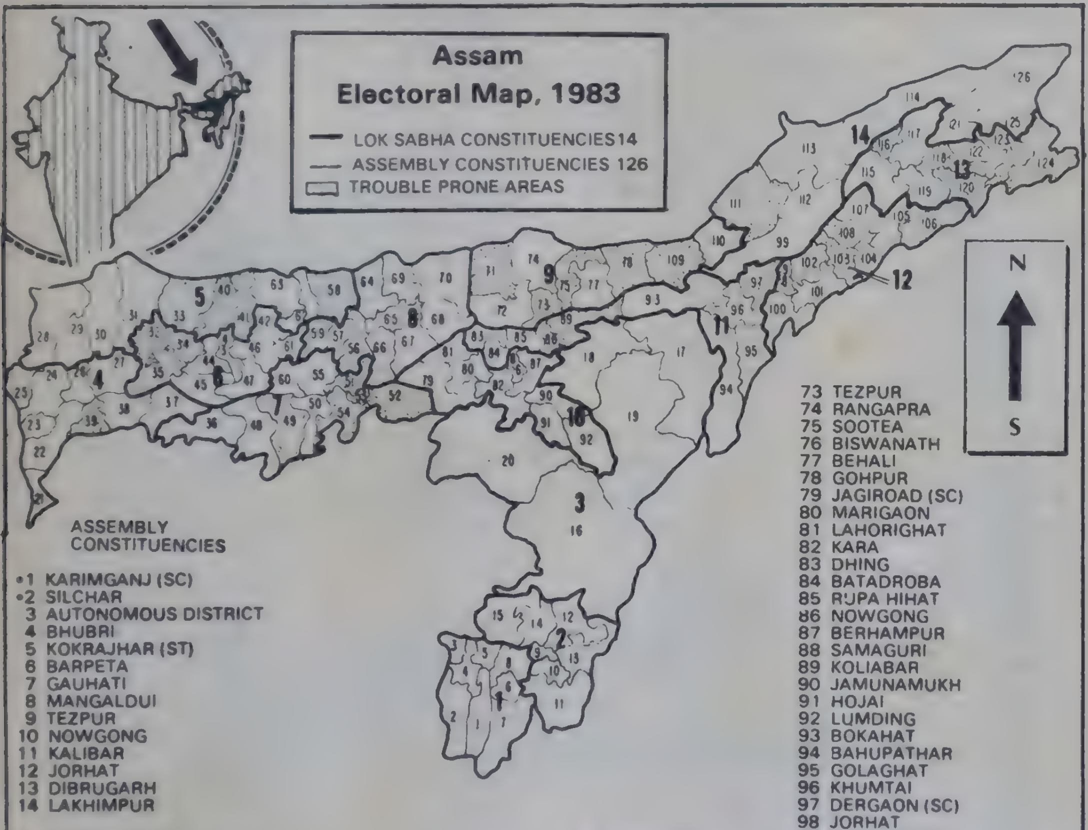
Elections in Assam & Meghalaya

The elections in Assam will be held in three phases on February 14, 17 and 20. In Meghalaya, the poll will be held on February 17 according to the tentative programme drawn up by the Election Commission.

The commission also announced simultaneous election to 12 vacant Lok Sabha seats in Assam and the Shillong Lok Sabha seat in Meghalaya.

January 8, 1983.



Assam Electoral Map, 1983

ASSEMBLY CONSTITUENCIES

•1 KARIMGANJ (SC)
•2 SILCHAR
3 AUTONOMOUS DISTRICT
4 BHUBRI
5 KOKRAJHAR (ST)
6 BARPETA
7 GAUHATI
8 MANGALDUI
9 TEZPUR
10 NOWGONG
11 KALIBAR
12 JORHAT
13 DIBRUGARH
14 LAKHIMPUR

• ELECTIONS HELD IN 1980

LOK SABHA CONSTITUENCIES

1 KATABARI (SC)
2 PATHARKANDI
3 KARIMGUNJ NORTH
4 KARIMGUNJ SOUTH
5 BADARPUR
6 HAILAKANDI
7 KATALICHERRA
8 ALGAPUR
9 SUCHAB
10 SONAI
11 DOLAI (SC)
12 UDHARBOND
13 LAKHIPUR
14 BARKHOLA
15 KARIGARA
16 HALFLONG (ST)
17 BOKAJAN (ST)
18 HOWRAHGHAT (ST)
19 DIPHU (ST)
20 BAITHALNGO (ST)
21 MANKACHAR
22 SALAMARA SOUTH
23 DHUBRI
24 GAURIPUR
25 GOLAKGUNJ
26 BILASPARA WEST
27 BILASPARA EAST
28 GOSAIGAON
29 KOKRAJHAR WEST (ST)
30 KOKRAJHAR EAST (ST)
31 SIDLI (ST)
32 BONGAIGAON
33 BIJNI
34 ABHAYPURI NORTH
35 ABHAYPURI SOUTH
36 DUDHAI (ST)
37 GOALPARA EAST
38 GOALPARA WEST
39 JALESWAR
40 SORBHOG
41 BHAWANIPUR
42 PATACHAKRKUCHI
43 BARPETA
44 JANIA
45 BAGBAR
46 SARUKHETRI
47 CHENGA
48 BOKO (SC)
49 CHAYGAON
50 PALASBARI
51 JHALUKBARI
52 DISPUR
53 GAUHATI EAST
54 GAUHATI WEST
55 BAJO
56 KAMALPUR
57 RANGIA
58 TAMULPUR
59 NALBARI
60 BARKHETRY
61 DHARMAPUR
62 BARAMA (ST)
63 CHAPAGURI
64 PANENRY
65 KALAIGAON
66 SIPAJHAR
67 MANGALDAUI (SC)
68 DALGAON
69 UDALGURI (ST)
70 MAJBAT
71 DHEKIAJULI
72 BARCHALLA
73 TEZPUR
74 RANGAPRA
75 SOOTEA
76 BISWANATH
77 BEHALI
78 GOHPUR
79 JAGIROAD (SC)
80 MARIGAON
81 LAHORIGHAT
82 KARA
83 DHING
84 BATADROBA
85 RUPA HIHAT
86 NOWGONG
87 BERHAMPUR
88 SAMAGURI
89 KOLIABAR
90 JAMUNAMUKH
91 HOJAI
92 LUMDING
93 BOKAHAT
94 BAHUPATHAR
95 GOLAGHAT
96 KHUMTAI
97 DERGAON (SC)
98 JORHAT
99 MAJULI (ST)
100 TITABAR
101 MARIANI
102 TEOK
103 AMGURI
104 NAZIRA
105 MAHAMARA
106 SONARI
107 THOWRA
108 SIBSAGAR
109 BIHPURIA
110 NAOBOICHA
111 LAKHIMPUR
112 DHAKUAKHANA (ST)
113 DHEMAJI (ST)
114 JONAI (ST)
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Assam
Electoral Background 1983

Religious composition of Assam (1971)

Community	*% of population*
Hindu	72.51
Muslim	24.56
Christian	2.61
Buddhist	0.15
Jain	0.09
Sikh	0.08
Total	100.00

Linguistic composition of Assam (1971)

Language	*% of population*
Assamese	59.44
Bengali	19.44
Hindi	5.34
Oriya	1.00
Bori	3.65
Mizo	1.70
Mikir	1.28
Miri	1.17
Misc.	6.88 (all below 1%)
Total	100.00

Correlation of religion, language and ethnicity

Ethnic group	*% of population*	*Religion (%)* Hindu	Muslim	Others	*Language (%)* Assamese	Bengalis	Others
Ahoms	10	10	—	—	10	—	—
Assamese of Aryan origin	12	9	3	—	12	—	—
Caste Hindus	6						
SC	3						
Muslims	3						
Mongoloid tribals	10	—	—	10	—	—	10
Bengali	41	17	24	—	24	17	—
Plantation labour	18	15	2	1	13	—	5
Hindustanis	3	2	1	—	—	—	3
Manipuris	2	1	1	—	—	2	—
Nepalis	2	2	—	—	—	—	2
Rajbansis	2	2	—	—	2	—	—
	100	58	31	11	61	19	20
			100			100	

International Events

January

Curfew clamped in Accra, capital of Ghana, after armed forces overthrow Government of Limann. New military ruler is Ft. Lt. Jerry Rawlings. Mr. Javier Perez de Cuellar takes over as the new Secretary-General of the United Nations (January 1). Egyptian President Mr. Hosni Mubarak dismisses his cabinet, forms new cabinet. Three top leaders of the National People's Party of Ghana, and ousted President Limann arrested (2). William Clark replaces Richard Allen as U.S. National Security Adviser. EEC threatens Russia with possible economic sanctions. If it intervened in Polish affairs (5). Letters of offer and acceptance signed between Pakistan and the U.S. for a number of major military items. Canada bans employment of foreign workers in mines, construction sites and some non-specialised occupations (6). Abdus Sattar elected new chairman of the ruling Bangladesh National Party. Soviet Union grants Poland a long-term loan of 2700 million roubles ($1,500 million) (7). Gen. Zia Ul Haq, Pakistan President, launches 287-member advisory council and lifts press censorship (11). Agha Shahi, Pakistan Foreign Minister, to visit Delhi on January 30. Recorded cold wave in parts of Europe and the U.S. (12). Gen. Zia-ul-Haq in Rome (16). Socialists defeated in four National Assembly by-elections in France. Indo-Sri Lanka microwave link inaugurated (18) Egypt and Israel agree on final withdrawal of Israeli forces from Sinai (19). Talks between India and Bangladesh on revision of

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1972 protocol of inland water transit and trade fail (22). Soviet Communist Party Secretary Michael Suslov dies (25). Mauno Koivisto elected President of Finland (26). Halg-Gromyko talks: USSR warns U.S. to stop interfering in the Polish internal affairs (27). France joins W. Germany in rejecting economic sanctions against USSR (30).

February

India and Pakistan agree on further talks on the no-war pact; China refuses to back U.S. on the Poland issue(February 1). Army seizes power in Surinam(5). U.N. General Assembly calls on members to refrain from economic and military assistance to Israel(6). Stiff opposition in the U.S. Congress to President Reagan's $ 757.6 billion budget(8). U.S. allows passage to Khalistan protagonist Jagjit Singh inspite of India's opposition(9). Bangladesh Council of Ministers dissolved(11). P.V. Narasimha Rao in Hanoi on a four-day official visit. India agrees to give long-term aid to Vietnam (13). Tension in Jaffna (14). Fighting flares up in Syrian town Hama. Sri Lanka shifts capital to Jayawardenapura (15). Pakistan Foreign Minister Agha Shahi resigns due to ill-health (16). Zimbabwe Prime Minister Robert Mugabe sacks Joshua Nkomo, veteran nationalist. Irish elections: No party gets absolute majority(17). Pakistan raises Kashmir issue at UN Human Rights Commission(20). South-South conference inaugurated in New Delhi—44 nations take part. Julius Nyerere, Tanzanian President, presented the 1981 Third World Prize in New Delhi(22). South-South conference concludes on a note of partial fulfilment. Canadian Government announces sanctions against Poland and Soviet Union(24). Soviet space probe (Venus 13) lands on Venus. 19 countries boycott Organisation of African Unity meeting at Addis Ababa(28).

March

Soviet space-craft Venus-13 lands on Venus (March 1). Photos used to denounce Sandinist Government in Nicaragua by Halg, faked (2). Greek President, Mr. Constantine Karamanalis, in Delhi (4). Second Soviet spacecraft Venus—14 lands on Venus (5). U.S. proposes $210 million as aid to India for 1983. Five assassins of President Sadat sentenced to death and jail terms for 17 years (6). Former Pakistan Governor, Arbab Sikandar Khan Khali, shot dead by gunman (7). Charles Haughey becomes Irish Prime Minister (9). A rare tryst of nine planets in the same quadrant observed. Violence in Guatemala: heart of the capital sealed off. Celestial spectacle of nine planets aligned on one side of the sun occurs without the feared ill-effects on the earth(10). National Liberation Council seizes power in Surinam(11). Sandinista Nicargua requests for help from all countries in the world. Shastri-Srimavo pact on Stateless persons of Indian origin not to be renewed and no fresh pact either(12). Army takes over government in Bogota(13) Soviet delegation led by Defence Minister Marshal Ustinov arrives in New Delhi on a six-day official visit; offers latest weapons(15). Soviet Union announces a moratorium on deployment of nuclear armaments in the European part of the USSR (16). Military forces arrest 260 people in Pakistan's Sind Province(17). Britain and the Vatican resume full diplomatic relations after a break of four centuries. Four Dutch journalists die in El Salvador shoot-out (19). Mrs. Indira Gandhi in London(21). "Festival of India" inaugurated in London. U.S. space shuttle Columbia takes off with two astronauts(22). Switzerland decides to join United Nations. Mohammadullah appointed Bangladesh Vice-President(23). Lt. Gen. H.M Ershad seizes power in a bloodless coup in Bangladesh. Coup in Guatemala: Junta headed by retired General Efrain Rios Mont(24). Some former Ministers arrested in Bangladesh. U.K. indicates that it would restore cuts in economic aid to India (25). A.F.M.A. Choudhary sworn in as Bangladesh President(27). Polling opens in El Salvador amidst fighting between security forces and guerillas

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West Bank riots spread to Israel proper(28). 74 killed in poll day clashes in El Salvador(29). U.S. Space shuttle Columbia returns to earth(30). EEC asks Israel to put an end to violence and repression in West Bank(31).

April

Argentina's military Junta occupies Falkland Isles, a British colony in South Atlantic(April 2). U.S. vetoes resolutions on Israel. Nicaragua in the U.N.(3). Argentina rejects U.N. resolution asking for its withdrawal from Falklands. Soviet Foreign Minister Gromyko in Belgrade(4). British Foreign Minister Lord Carrington and two colleagues resign on Argentina issue. Kim Il Sung re-elected North Korean President(5). British fleet leaves for Falkland(6). U.S. President Reagan sends Alexander Haig to London to help resolve Falkland crisis. 10,000 feared dead in the recent eruption of the Chichonal volcano in Mexico(7). Syria shuts down an Iraqi pipeline that pumps crude oil(11). British blockade of the Falkland Islands, goes into effect. Pakistan rules out accepting all Bihari repatriates from Bangladesh(12). Haig's mission of mediation between Britain and Argentina on Falkland crisis 'fails'. India signs deal for the purchase of 40 Mirage-2000s with France. Art Buchwald and John Updike win Pulitzer awards. Romanian President Nicholae Ceauseacu in Beijing(13). French President Francois Mitterrand in Tokyo on a five-day visit. U.S. announces decision to sell arms to Taiwan(14). Iraq accuses Syria of confiscating 1.5 million barrels of crude oil before shutting up pipeline(15). Argentine warships move towards Falklands; Britain bracing itself for a long naval blockade. Mercenaries surrounded by Seychelles and Tanzanian troops threaten to blow up Air India jetliner if the pilot refuses to fly them to South Africa, afte a bungled coup bid(16). Mrs. Indira Gandhi arrives in Jeddah. India and Saudi Arabia set up joint commission. P.V. Narasimha Rao, External Affairs Minister, in Tokyo. A new constitution for Canada comes into force(17). Egyptian Foreign Minister, Kamal Hassan Ali, and the Israeli Prime Minister Begin solve differences on Sinai(20). Malaysia goes to polls. World Hindu conference in Colombo(22). Dr. Mahathir Mohamed scores big win in Malaysian elections(23). Egypt officially gets back Sinai peninsula, 15 years afte Israelis occupied the area(25). Britain recaptures South Georgia island off Falklands; Argentine commander surrenders(26). Britain declares total air-and-sea blockade, around the Falkland islands(28). 300 Indians refused entry into Singapore as part of crackdown against illegal foreign workers. Sri Lanka's new Parliamentary complex declared open at Jayawardenapura(29). Sea Law convention adopted(30)

May

Portugal orders out Czech Ambassador(May 1). World famous violinist William Primrose(77) dies(2). Algerian Minister dies in plane crash near Turkish-Iranian border(4). Britain and Argentina accept UN proposals to end hostilities in the Falklands(6). U.K. Forces attack Falklands capital. Luis Alberto Monge becomes Costa Rican President(9). U.K. troops land on Falklands, pull out(10). A manned Soviet spacecraft docks successfully with orbiting Salyut-7(15). India and China begin talks(17). Impasse in India-China talks(20). U.K. troops land on Falklands. Chairman of the PLO, Mr. Yasser Arafat arrives in Delhi on a three-day visit(21). Iran announces recapture of Iraqi-occupied city of Khorramshahr after 20 months of Gulf war(24). Japan lowers tariff barrier for U.S., EEC(27). Pope John Paul II in London(28). Yasser Arafat leaves Beirut(30).

June

Battle for Falklands nears climax after British troops capture strategic heights. (June 1). US-China discussion on nuclear cooperation. South Africa enacts new security law(2). Israeli forces invade South Lebanon by air, land and sea, while PLO vows 'to fight until death' to defend its power base(6). Turkish diplomat shot dead near Lisbon(7). US

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President Ronald Reagan proposes that he and the Soviet leader Leonid Brezhnev should make separate addresses to each other's people on TV in a peaceful confrontation between democracy and communism(8). King Khalid of Saudi Arabia dies(13). Israel takes control of Beirut airport(14). Argentina surrenders to Britain in the Falklands(15). US Secretary of State Alexander Haig resigns. Lebanese Prime Minister Shafiq-al-Wazzan resigns(25). UN General Assembly demands Israeli withdrawal from Lebanon(27). Alitalia Airlines plane flying between Rome and Tokyo hijacked by Sri Lankan national, Sepala Ekanayake. PLO agrees to leave Beirut(30).

July

Sri Lankan hijacker frees the last of 261 hostages aboard the jumbo airliner after being reunited with estranged wife and son (July 1). Japanese Government following the lead of Britain, makes known that it will defy the U.S. embargo on the supply to the Soviet Union of U.S.-developed equipment produced in Japan under licence(2). Dominican President A. Guzman dies(4). Miguel De La Madrid elected President of Mexico(5). Leader of anti-Vietnamese coalition Government, Prince Norodom Sihanouk enters rebel-held territory in Kampuchea for the first time since fleeing the country 3-1/2 years back(7). 156 die in Pan American World Airways jet crash in a residential area after take-off in a thunderstorm near New Orleans airport(9). IMF unanimously decides to permit India to draw up to 1800 million SDRs equivalent to about Rs. 1,800 crores—the second tranche of the SDRs five billion dollar loan(10). Iranian forces cross Iraqi border(14). Former Nepalese Prime Minister B.P. Koirala dies(21). Iraq advised by a number of non-aligned countries to postpone Baghdad summit. French Government ignores U.S. threat on pipeline project. India wins 74 prizes including top award in the Seventh photo contest in Asia and the Pacific organised by the Asian cultural Centre for UNESCO in Tokyo(23). Dr. Richard H. Lawler (86), Nobel Prize nominee, who performed the world's first kidney transplant dies(24). The Prime Minister Mrs. Indira Gandhi in U.S. declares India has no nuclear weapons and wants to use nuclear energy for peaceful programmes. Sri Lanka Government clamps nationwide emergency. U.K. court upholds school bar on turbaned Sikh student. 21-year-old Egyptian, Khaleel Ahmed Hassan with only one leg, swims the channel from England to France in 12 hours 39 minutes(31).

August

Massive Israeli attack on West Beirut (August 1). The nuclear Research Centre, Strasbourg, France, achieves world first in its successful application of 18 million volts to an electrostatic cyclotron(2). The Prime Minister, Mrs. Indira Gandhi leaves U.S. at the end of an official visit(4). Foreign Ministers of ASEAN dismiss Vietnam's latest Kampuchean settlement offer. Italy's 41st Government, since 1945 resigns; the Prime Minister, Giovanni Spadolini resigns(7). Two Canadian pilots land in Montreal shattering world record for flying around the world in a single-engine Cessna 210 aircraft with an unofficial time of six days, seven hours and 30 minutes. Iraqi Foreign Minister, Sadoun Hammadi in New Delhi to press for India's support on holding at least the Foreign Ministers meeting in Baghdad(8). U.N. World Assembly on Ageing unanimously adopts 48-point plan of action to improve the quality of life for the elderly and deal with the problems of ageing(9). Reagan Administration's plans to build support bases for the Persian Gulf to save the oilfields from surprise attacks, receive setback as Appropriations Committee of the House of Representatives refuses to approve funds(12). Polish Militia use teargas to halt clashes that broke out in Gdansk. The visit of a dance troupe headed by Bharati Shivali cancelled abruptly in deference to Islamabad's regulations

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restricting public performances by women(13). China and U.S. sign new document limiting future supplies of arms to Taiwan and governing their own relations with Taiwan(17). Seychelles troops crush army mutiny. Soviet Union launches into space a woman cosmonaut along with two male cosmonauts for a rendevous with the orbiting space station Salyut 7(18). PLO pull out from beirut begins(21). The Prime Minister Mrs. Indira Gandhi in Mauritius on a three-day official visit(23). 40-year-old unmarried psychologist, Dr. Afton Blake, gives birth to the second baby to be produced with the help of 'Nobel' sperm bank. China rejects Indian protest against the opening of a new road linking Pakistan and China along the ancient silk route(25). Ingrid Bergman (67) Swedish-born film star dies(29).

September

India insists that Sri Lanka organise the Kachchativu festival in March 1984. Ayotollah Khomeini says Iran should conclude its war with Iraq quickly, so that it can march on Israel. PLO completes evacuation of Israeli-ringed W. Beirut two days ahead of schedule. Polish communist leader W. Gomulka dies (Sept. 1). Successful trial run in Japan of a new extra fast remote-controlled train which floats above the line on a magnetic field(2). World Bank chiefs, A.W. Clausen and Mr. J. De Larosiere, present a dismal picture of global economy at the annual meeting of Governors in Toronto(6). World's highest submarine mountain discovered in the Samoan Archipelago by Soviet research ship 'Callisto'(12). Former Chairman of the Chinese Communist Party, Hua Guo Feng is dropped from the ruling Politburo(13). Lebanon's President-elect Bashir Gemayel (34) is assassinated in a bomb explosion(15). Pope John Paul II and Yasser Arafat, PLO Chairman, meet(16). Mass massacre in two Palestinian refugee camps in W. Beirut(18). British Prime Minister Mrs. Thatcher in Beijing (22).

October

Conservative Opposition leader, Helmut Kohl is elected Chancellor of W. Germany ousting Helmut Schmidt mid-term through a parliamentary vote (Oct. 1). Bomb explosion in Teheran kills 60 persons and wounds at least 700(2). Laurie Skresled of Canada scales Mount Everest(3). Egypt extends for a year emergency imposed following President Sadat's assassination. Soviet Vice-Foreign Minister, Leonid Ilyichew in Beijing for talks(5). Lebanese troops take control of all Beirut, for the first time in eight years. Poland's independent trade union Solidarity is dissolved by an Act of Sejm, the Parliament. Lord Nobel Baker (92), Nobel Peace Prize winner and former Labour Party Cabinet Minister, dies in London(8). Dr. Anna Freud (86), a psychoanalyst and daughter of pioneer psychoanalyst Sigmund Freud, dies. U.S. experiences the worst phase of unemployment (10.1 per cent or 11,260,000 people out of work) in 42 years. Panel of experts concludes that there has been substantial and serious leakage of American technology to the Soviet Union, including "significant portions" damaging to national security(9). Japanese Premier Zenko Suzuki resigns(12). Pakistan accepts first of 40 F-16 fighter aircraft from U.S.(13). Halley's comet sighted at Mt. Palomar near San Diego for the first time since it last zipped by the earth in 1910. Iranian Supreme Court, last vestige of the former Shah's rule, abolished(16). Pakistan President Gen. Zia-ul-Huq in Beijing(17). Pierre Mendes-France (75), former French Premier and World War II resistance leader, dies(18). A 14-member parliamentary delegation sponsored by the India-China Friendship Society leaves for China on 12-day visit(19). J.R. Jayawardene of the United National Party is elected Sri Lanka's President for the second time(21). Israeli Defence Minister, Mr. Ariel Sharon tells judicial enquiry that he personally authorised the entry of the Lebanese Militia into Palestinian refugee camps where

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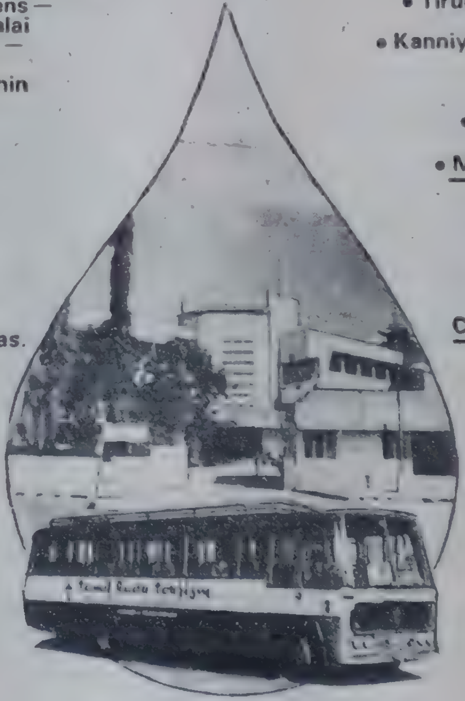

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civilians were slaughtered(25). Khan Abdul Ghaffar Khan, 96-year-old veteran Pathan leader, arrested(30). Mr. Gaston Thorne, President of the European Economic Commission in New Delhi(31).

November

The Taiwan Communications Minister says in Taipei that every village on the Island can now be reached by telephone. Gen. Zia-Ul-Huq arrives in Jakarta (November 2). Soviet President Lenoid Brezhnev warns of a "crushing retaliatory strike" in the event of armed aggression against the country. Iran claims to have penetrated 10 km inside Iraqi territory and announces its intention to forge ahead(7). More than 1,000 persons, including Soviet troops and Afghan civilians die as a fuel tanker catches fire and explodes after a collision, north of Kabul(9). Soviet President Leonid Brezhnev (75) dies in Moscow(10). U.S. Space shuttle, Columbia flown into orbit by its four astronauts(11). Lech Walesa, leader of outlawed Poland's Solidarity free trade union, is released after 11 months of internment. Yuri Andropov, Communist leader, succeeds Brezhnev as General Secretary of the Soviet Communist Party. Astronauts of U.S. Space Shuttle Columbia release Canadian satellite fulfilling the first commercial contract to launch satellites(12). Seventyfive Israelis including the Prime Minister Menachem Begin's wife die in a building blast in Lebanon(14). Mrs. Nusrat Bhutto, widow of executed Pakistan Premier Zulfikar Ali Bhutto, leaves for Frankfurt for treatment of suspected cancer(18). Wu Xuequan replaces Huang Hua as Chinese Foreign Minister(19). Khan Abdul Ghaffar Khan released(20). Yasuhiro Nakasone is elected Japan's Prime Minister(26). Row in the U.N. over who discovered America puts off decision on whether to celebrate 500th anniversary of the arrival of Christopher Columbus in the new world. World premiere of Sir Richard Attenborough's 'Gandhi' in New Delhi(30).

December

Miguel De La Madrid is sworn in President of Mexico. Amintore Fanfani, Christian Democrat, forms Italy's 43rd post-war Government (December 1). Spain's first socialist majority parliament elects Felipe Gonzalez Prime Minister. Sixtyone-year-old Barney Clark, given an artificial heart(2). Britian expels Soviet Embassy's Naval attache, Capt. Anatoli Zotov for trying to build up a network of agents(3). China adopts new constitution that replaces Maoist principles(4). Socialist Government in Spain signals its decision to quit NATO(6). China issues two stamps to mark 40th anniversary of the death of Dr. Dwarakanath Kotnis. Helicopter-borne South African troops raid Maseru, Lesotho's capital and kill 30 members of banned African National Congress(9). Soviet cosmonauts, Anatoly Berezevoi and Valentin Lebedev return to earth after 211 days in space, a new endurance record. Eighty-four Red Indian children killed following the crash of a helicopter evacuating them from "area of violence" in northern Nicaragua(10). Thousands of women form 15-km human chain around U.S. Air Force base in Berkshire, London in anti-nuclear protest(12). Pakistan capital's last two remaining discos are closed down in accordance with official policy of turning the country into Islamic State(13). The big green gate between the British colony of Gibraltar and Spain is reopened after 13 years(14). More than 3,000 persons are reported dead in an earthquake in North Yemen(15). Death and violence erupt in "march for democrary" led by 100,000 demonstrators in Buenos Aires, Argentina demanding an end to military rule(16). Sri Lanka President J.R. Jayewardene wins refere—ndum(23).

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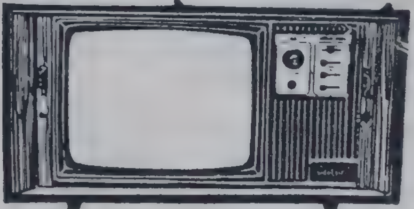

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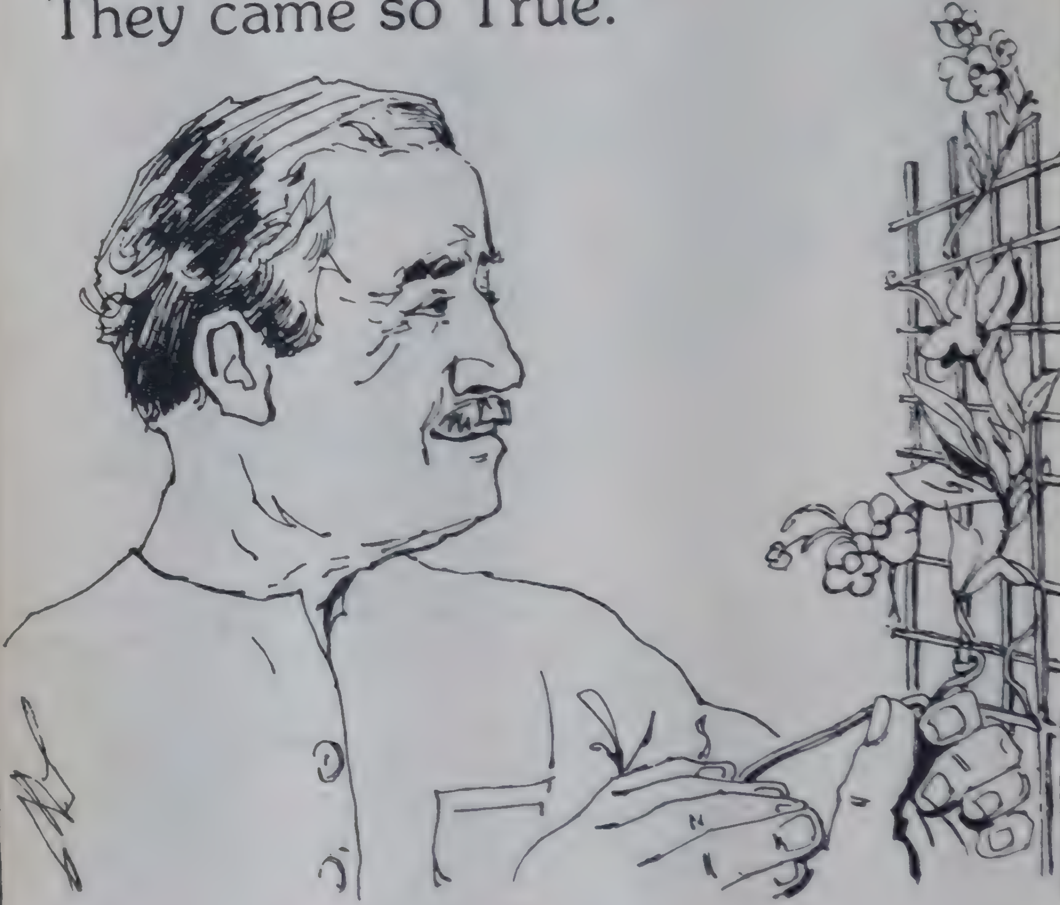

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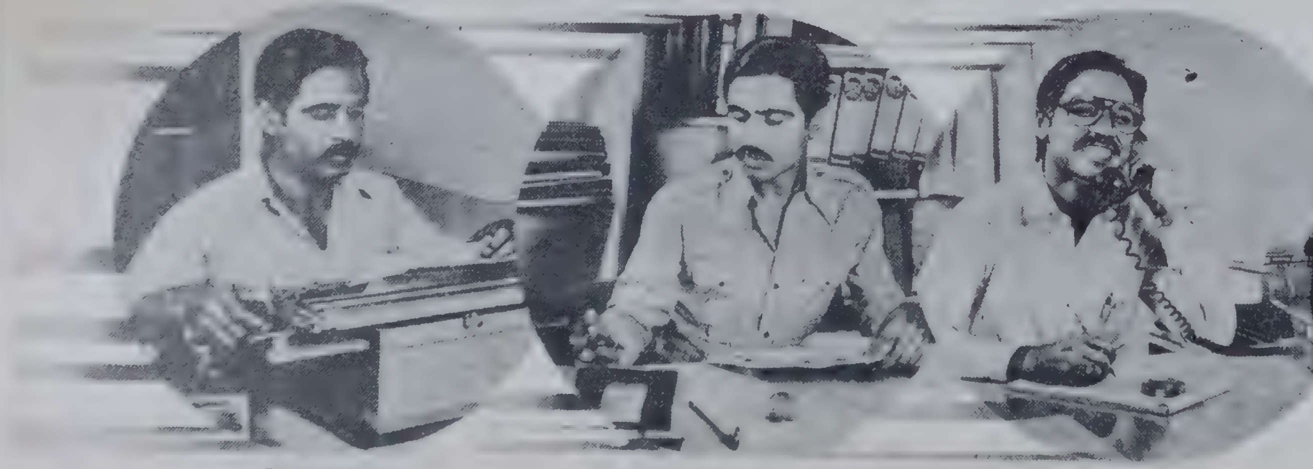

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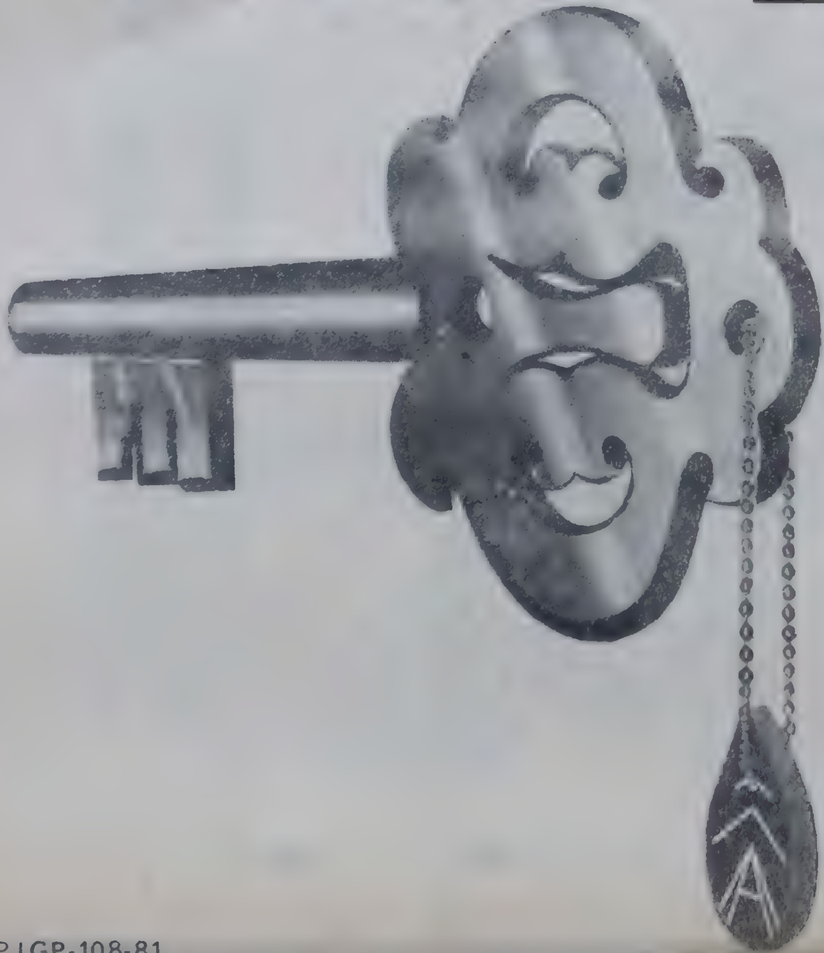

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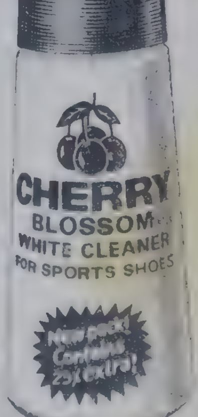

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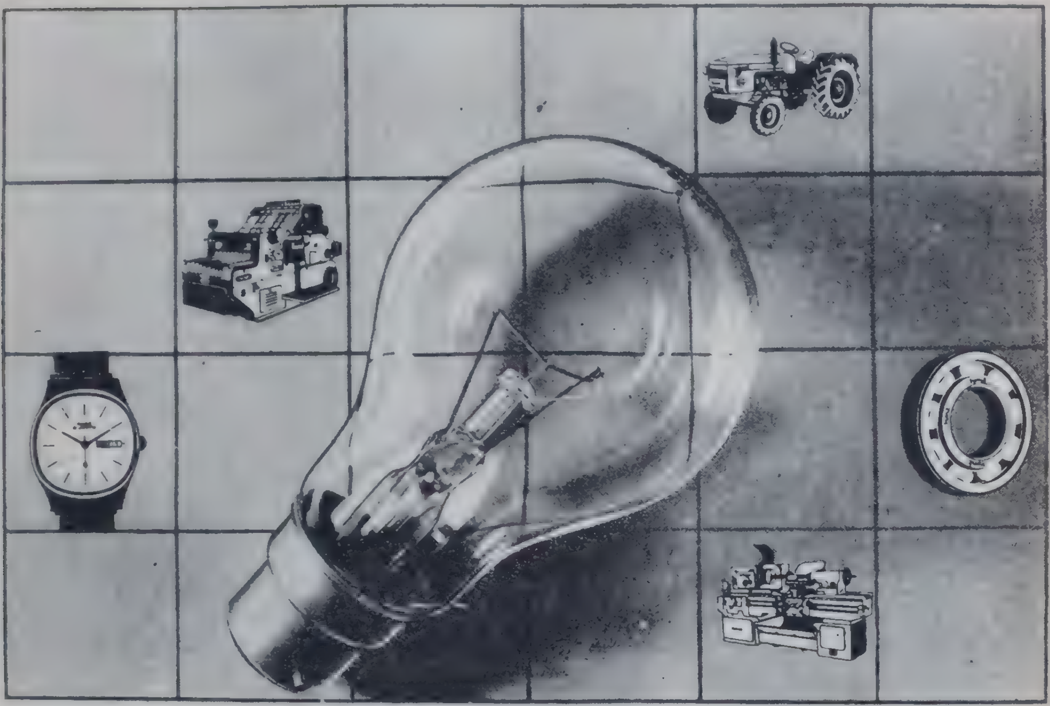

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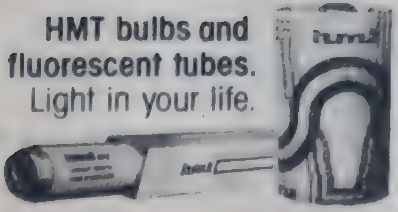

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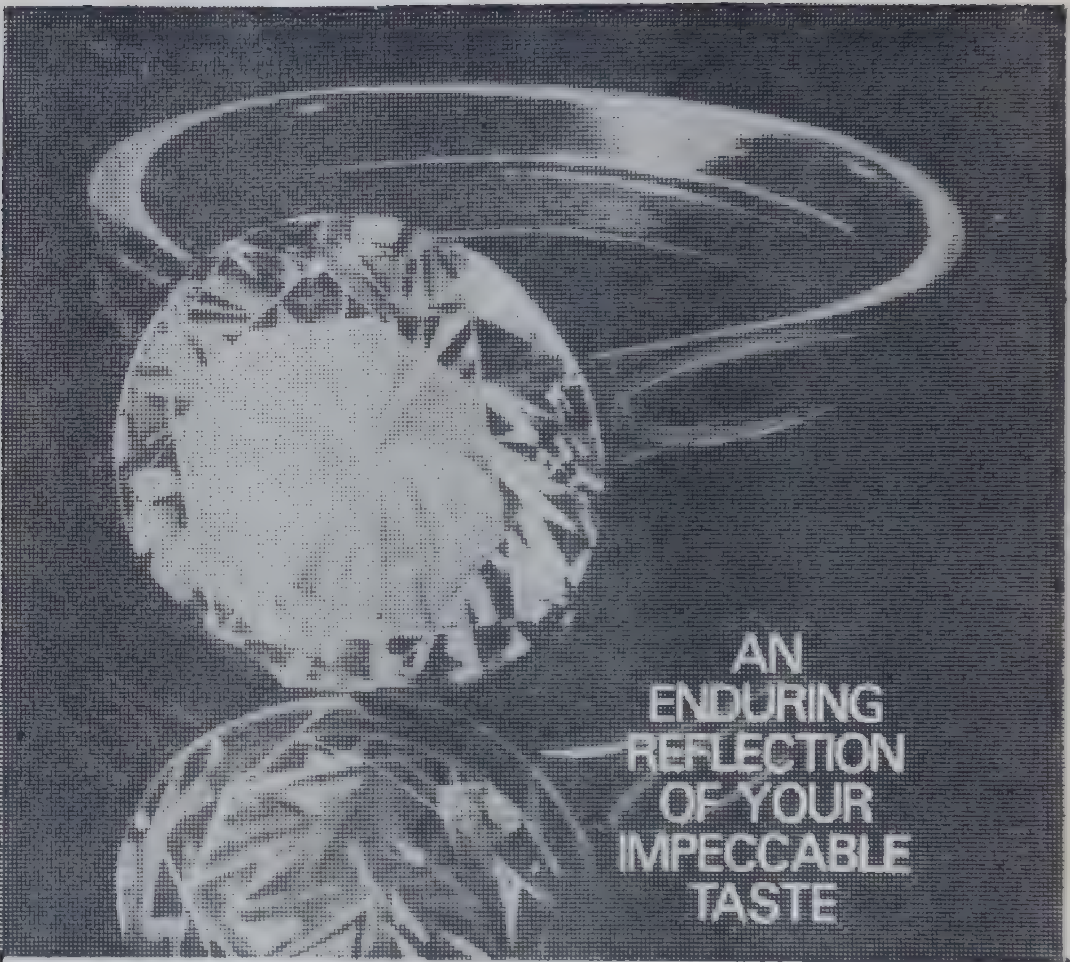

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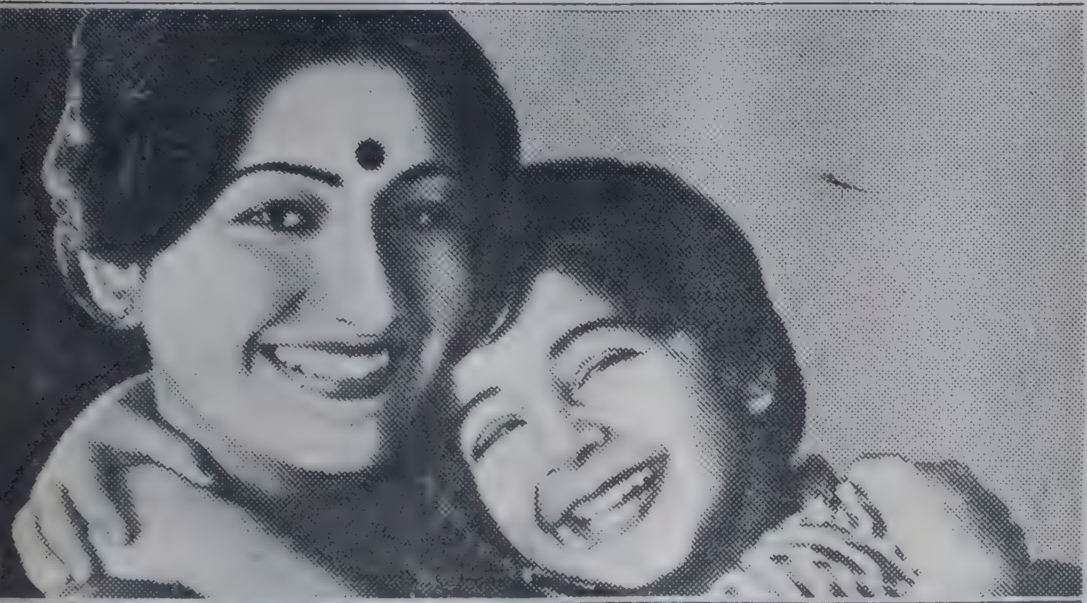

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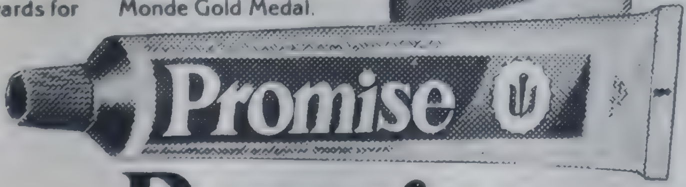

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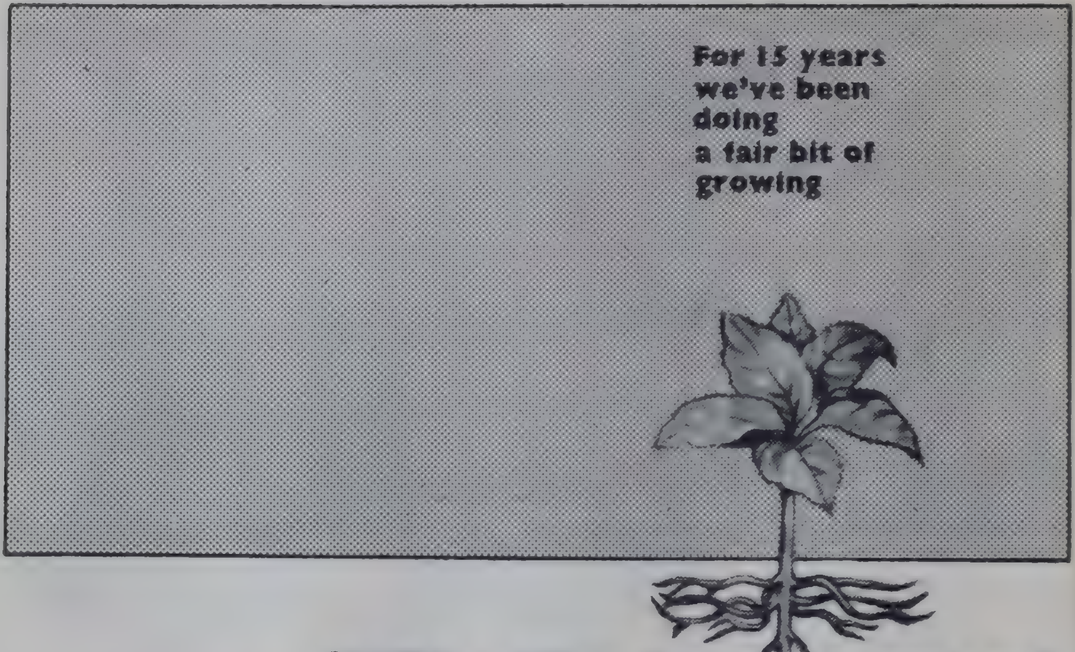

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PART I

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1. SPACE

Man's conception of the Universe or Space had been changing through the centuries. Even the name itself had changed in course of time. When the Universe was first conceived of as an orderly unit, it was called *Cosmos* (as opposed to chaos or disorder) and the study of Cosmos came to be known as Cosmogony or Cosmology. Today, we speak of Space and Space sciences.

In 140 AD, Claudius Ptolemy, the first great cosmogonist, propagated the thesis that the Earth was the centre of the Universe and that the Sun and all other heavenly bodies revolved round it. This idea ruled for many centuries until Copernicus came on the scene in 1543 AD. Copernicus argued that the Sun was the centre of the Universe, not the Earth.†

Though the Copernican theory changed the centre of the universe it did not change its extent. The Copernican universe was still equated with the Solar System. It took another three and a half centuries before our ideas changed further. By 1805 telescopic studies made by the British astronomer, Herschel, made it clear that the universe was not confined to the solar system. The solar system itself was only a part of a much vaster star system called the galaxy. The universe thus became quite extensive comprising millions of stars scattered about the Milky Way. But our vision of the universe ended there.

As the 20th century opened, it seemed that the Milky Way galaxy with its cluster of over a hundred billion stars together with its attendant satellites, the Magellanic clouds, actually represented all there was to the universe. In 1925 the American astronomer Edwin P. Hubble(1889—1953) pointed out that there were other galaxies in the universe and that the universe actually consisted of millions of galaxies like the Milky Way. In 1929 Hubble proved that these galaxies are flying away from each other and that the farther they are the faster they fly. This meant that the universe is expanding like a balloon that is being blown up. The expansion of space or the flight of galaxies being uniform in all directions, an observer located at any one of the galaxies will see all other galaxies flying away from him at velocities proportional to their distance from the observer.

Looking from the Milky Way we find that our outer galaxies are receding at increasing velocities. A cluster of galaxies in the constellation of Virgo, some 50 million light years away (from us), is seen moving away at about 750 miles per second, while a group in Hydra, 2700 million light years away is racing off at as much as 36,000 miles per second. Our own galaxy, the Milky Way, in comparison, appears to move slowly at a modest speed of 600 km per second.

How big is the Universe? This tricky question still remains unanswered. If as Hubble showed the speed of galaxies increases with distance there must come a point at which galaxies fly at the speed of light. At this point we cannot observe anything. As Isaac Asimov puts it "From Hubble's demonstration of increasing speed of recession with distance....it would now appear that at a distance of 12.5 billion light years, galaxies would be receding, relative to us, with the speed of light. Nothing beyond that could be observed. The observable universe has a diameter of 25 billion light years and the number of galaxies it contains is uncertain."*

Doppler Effect. The movement of a star or a galaxy affects its light as seen by an observer. If the star is moving towards the observer, its light will be shifted towards the blue end of the spectrum. If the star or galaxy is moving away from the observer its light will be shifted to the red end of the spectrum. This is known as the Doppler Effect or Shift. The Doppler shifts of galaxies show that they are receding and that the universe is in a state of rapid expansion.

THEORIES OF SPACE

Modern theories of the universe are based on this flight of galaxies, that is, on the assumption that matter is in a state of rapid expansion.

It seems to be generally assumed that our universe started out as a superdense ball. It is argued that if the universe is now expanding (as Hubble has shown) it must have been, once upon a time, in a state of high compression. High compression means high density. We have, at present, no means of knowing how high the density of the original universe was.

---

† Also, see *Earth*, infra

* Eyes on the Universe.

The nearest guess is that the overall density of the universe, at that time, was comparable to the density of the nuclear fluid, tiny droplets of which form the nucleii of various atoms.* It is calculated that the density of the atomic nucleus is a hundred thousand billion times greater than the density of water. If the density of the primordial universe was of this order, it follows that each cubic centimetre of space (universe) at the time contained a hundred million tons of matter.

Expansion. It is a general law that all material bodies are heated when compressed and cooled when expanded. The primordial universe, being highly compressed, must have experienced high temperatures. Heat, as we know, tends to expand matter. High temperatures, therefore, must have, at some point, started an expansion of the universe. It is this expansion which is continuing even now. All theories of space (universe) seek to explain the nature and consequences of this expansion.

Big-Bang Theory. Abbe Georges Lemaitre, a Belgian astronomer-priest, explained this process of expansion, in what is known as *the big-bang theory*. He argued that billions of years ago, cosmic matter (universe) was in an extremely compressed state, from which expansion started by a primordial explosion. This explosion broke up the superdense ball and cast its fragments far out into space, where they are still travelling at thousands of miles per second. It is from these speeding fragments of matter that our galaxies have been formed. The formation of galaxies and stars has not halted the speed of expansion. And, as it happens in all explosions, the farthest pieces are flying the fastest.

The primordial explosion is the hallmark of the big-bang theory. But it also differs from other theories in two important respects. It disagrees with the Steady State claim, that new matter is being continuously created in the universe. It differs from the Pulsating theory, in that, it does not admit, that matter will revert to the original congestion point, from which the primordial explosion started.

Steady State Theory. This theory originally advanced by two astronomers, Thomas Gold and Hermann Bondi, has since received support from the British astronomer Fred Hoyle. According to this theory, which is also known as the *continuous creation theory*, galaxies recede from one another but their spatial density remains constant. That is to say, as old galaxies move apart new galaxies are being formed in the vacancies. These new galaxies are formed from new matter which is being continuously created to replace old matter which is being dispersed.

An interesting question arises here. How much new matter has to be created to compensate for the dispersion of matter by expansion? George Gamow suggests that if one hydrogen atom per litre of space is created once every billion years, it would be enough to replace matter, which is being lost continuously by expansion. This implies that comparatively very little creative work is involved in replacements.

If dispersing or dissipating galaxies are replaced by new galaxies, the universe will not change in appearance, to an observer located at any one point. Expansion, in other words, does not change the appearance of the universe. It has always been and always will be like what it is now.

Pulsating(Oscillating)Universe Theory. According to this theory, advocated by Dr. Alan Sandage, among others, the universe expands and contracts alternately between periods running into tens of billions of years. Dr. Sandage thinks that some 12 billion years ago, a great explosion occurred in the universe and that the universe has been expanding ever since. It is likely to go on expanding for 29 billion years more, when gravitation would halt further expansion. From then on, all matter would begin to contract or collapse upon itself in a process known as 'implosion' for 41 billion years into an extremely superdense state which will explode once again. This is the latest theory of the evolution of the universe.

Open or Closed Universe? That the universe is expanding is today considered established. A question that remains unsettled is whether the expansion will continue for ever or whether the receding galaxies will some day stop and then reverse their motion, eventually falling together in a great collapse. The answer to this question determines the geometrical character of the universe, that is, it determines the nature of space and time. If the expansion continues perpetually the universe is "open" and infinite. If it will some day stop and reverse direction, the universe is closed and of finite extent.

---

* George Gamow.

In order to choose between those possibilities, astronomers construct mathematical models of the universe and then attempt to find observable features of the real universe that would confirm one of the models and exclude all others. So far no single measurement has been made with enough precision to settle the question unambiguously. Several independent tests are possible, however, and pieces of the puzzle have been supplied by many workers employing quite different techniques. It now seems feasible to assemble the pieces. Taken together, the available evidence suggests that the universe is open and that its expansion will never cease.

1

The Forces of Nature

The forces operating in the Universe have conventionally been divided into four categories i. gravitational ii. electromagnetic iii. strong and iv. weak. Broadly speaking gravitational force binds matter to form stars and galaxies. Electromagnetic force binds electrons and nuclei to form atoms and atoms and molecules to form all matter, animate and inanimate. Strong force is the force in the core of the atom, the nucleus. It binds neutrons and protons to form nuclei. Weak force appears to be a disruptive force. It disrupts nuclei, neutrons and other elementary particles. Weak force operates slowly, almost imperceptibly but steadily.

We owe the theory of weak force or weak interaction to the Italian scientist Enrico Fermi. In 1934 Fermi argued that the beta decay of the neutron was a weak interaction. He postulated that weak interaction was responsible for particle disintegration. Very soon came confirmation of his hypothesis and the discovery of many subatomic particles, muons, pions, kaons and the like.

Recently, the Nobel Award in Physics to three scientists—Glashow and Weinberg (Americans) and Abdus Salam (Pakistani) has brought weak interaction into the limelight. Their citation says that their researches have been of great importance for the intense development of particle physics in this decade. Their work has thrown new light on the interaction of the weak as well as strong forces within the nucleus of elementary particles. It is highly theoretical basic research but produces practical spin off in the solar energy and radioactive fields.

The weak interaction is of great importance. The hydrogen fusion producing the energy of the sun, all-important for life on earth, is primarily caused by the weak force, transforming hydrogen into heavy hydrogen (deuterium) in the first link of a chain of nuclear reaction in the interior of the sun.

Without the weak force, solar energy production would not be possible. On the other hand, had the weak forces been much stronger, the life span of the sun would have been too short for life to evolve on any planet in the solar system.

The weak force interaction also finds practical application in the radioactive elements used in medicine and technology. It provided the basis for the so-called carbon-14 method for dating organic archaeological remains.

2. OUTER SPACE

The difference between space and outer space is that space means the whole universe including the earth while outer space means all space other than the earth. In fact, outer space begins where the earth's atmosphere ends and extends on and on in all directions.

Light Year. Outer space is infinite. Our terrestrial units of measurement hardly suit its dimensions. So we have evolved new units of measurement like the Light Year and the Astronomical Unit.

A Light Year is the distance covered by light in one year in vacuum travelling at a speed of 299,792.5 km* per second or about 186,282 miles per second. A light year is thus 5.88 million-million miles.

Astronomical Unit (A. U.). A new unit in space dimensions has been evolved by radar astronomy. This unit is called Astronomical Unit (A. U.). It represents the mean distance between the sun and the earth, calculated on the data supplied by radars. This distance—the Astronomical Unit—has now become a key constant in determining distances in the solar system.

---

* This velocity was accepted as one of the Astronomical Constants by the International Astronomic Union in 1968.

A. U. in terrestrial measurements is approximately 93 million (92,857,000) miles or 150 million (149,600,000) km. In terms of space dimensions, we may say that a Light Year is made up of about 60,000 A. U. s.

The new technique is likely to revise our established ideas of space dimensions based on the speed of light. It is now known that the velocity of a radar pulse is accurate to one part in 100 million, whereas the velocity of light is known only to be accurate to one part in a million. This means that the error in radar reading is only one-hundredth of what it would be in light measurements.

Tracking Outer Space. Light and sound are the two principal media through which we gather our impressions of the external world. Light is something we can see (visible) and sound is something we can hear (audible). This was considered an axiomatic truth till the end of the 18th century. As the 19th century broke, this simple belief was shattered. Astronomers and physicists learned that there are invisible lights and inaudible sounds.† The first break came in 1800 when the British astronomer William Herschel (1738-1822) discovered infrared radiation.

The Solar Spectrum. When sunlight (white light) is passed through a prism it is broken up into rays of different colours, like those of the rainbow. Traditionally, seven colours are known, which are epitomised by the acronym‡ VIBGYOR, that is, *violet, indigo, blue, green, yellow, orange* and *red.* This is called the Solar Spectrum, with the violet colour at one end and the red colour at the other end. In studying the heating effects of the solar spectrum, Herschel placed a thermometer in each of the colours of the spectrum and an extra thermometer outside the spectrum at the red end. The thermometer outside the spectrum (at the red end) showed a higher degree of heat than any other inside the spectrum. He called these rays *infra-red* (below the red) rays. In 1801 the German physicist Johann Ritter (1776-1810) discovered that the rays outside the spectrum at the violet end, broke down silver chloride more quickly than the rays within the visible spectrum. These came to be called *ultraviolet* (beyond the violet) rays. It thus turned out that sunlight formed not only a visible spectrum but also an invisible one.

Angstrom Unit. In 1803 Thomas Young (1773—1829), a British physicist, showed that light travelled in tiny waves of varying wavelengths. The waves were too small to be measured by conventional scales. So Anders Angstrom (1814-1874), a Swedish physicist, evolved a new scale to measure wavelengths. He chose a unit equal to ten-billionths of a metre. This has since become known as the *Angstrom unit.* Ten *Angstroms* are equal to a *milli-micrometre* (a thousandth of a millionth of a metre) which in terms of modern SI units* is equal to a *nanometre.* (See Tables below). Measured in Angstrom units, the ultraviolet rays were nearly 4000 Angstroms while the infra-red rays were a little more than 7000 Angstroms. In between came a series of wavelengths for the various colours. They were found to increase steadily from the ultraviolet end, through the violet, indigo, blue, green, yellow, orange and red to infrared at the other end.

Electro-Magnetic Spectrum. The invisible ultraviolet and infrared radiations remained inexplicable till James Clerk Maxwell (1831—1879), the British physicist, came out with his *Electro-magnetic thesis* in 1870. Maxwell argued that electricity and magnetism were different aspects of a single electro-magnetic field. Periodical variations in the electro-magnetic field produced electro-magnetic radiations of varying lengths. The visible light is only one part, and a very small part, of the electro-magnetic spectrum. He also postulated that there can be other invisible radiations much shorter than the ultraviolet at one end and far longer than the infrared at the other.

The Maxwellian theory was vindicated when the German physicist Heinrich Hertz (1857-1895) produced electro-magnetic radiations with wavelengths much longer than the infrared. These wavelengths were at first called *Hertzian waves* but eventually came to be known as *radio waves.* Then in 1895, another German physicist Wilhelm Rontgen (1845—1923) discovered what he called *X-ray radiation.* The X-ray was later found to be much shorter in wavelength than the ultraviolet. In 1896, the French physicist, Henri Becquerel (1852—1905), discovered the phenomenon of *radio activity.* Becquerel did not at that time know why or in what manner this radio activity took place. Subsequently it was found that this radio activity was caused by the atoms of the heavy metal *uranium* giving off a constant emission of radiation and particles. It was further shown that this radio activity was also electro-magnetic in nature. Rutherford named it the *gamma ray*. The gamma ray had a wavelength even shorter than that of the X–ray.

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† See *Sound* infra.

‡ See *Acronyms* infra.

* See *International System of Units* infra.

Photons. In 1905 Einstein showed that all forms of radiation travelled in wave packets, which acted like particles in some ways. He called these packets *Photons*. The energy of the photons increased as the wavelength decreased. The wavelength is related to frequency, that is to say, the number of vibrations or waves or cycles per second. The shorter the wavelength, the higher the frequency and the greater the energy. Thus gamma rays with the shortest wavelength (below 0.01 nanometre) are the most energetic, the energy decreasing as the wavelength increased, through X–ray (1 to 0.01 nano), ultra–violet (1 to 400 nanos), visible light in all the colours of the spectrum (400 nanos to 700 nanos), infrared (700 nanos to 1 millimetre), micro waves (1 millimetre to 500 millimetres or 50 centimetres) to radiowaves which have the longest wavelengths (50 centimetres to 3000 centimetres or 30 metres) and the lowest energy content. (See Tables below).

Thermal Radiation. Every object which is at a temperature above *Absolute Zero*† (-273°C) radiates photons of all kinds. The average energy of the photons emitted increased with the temperature. We experience this heat during the peak period (noon) in visible light radiation. But even objects which are not hot enough to glow like the sun still radiate quantities of infrared radiation. Our own bodies, for instance. Even objects below our body temperature, i. e., cool bodies, radiate micro waves and longer radio waves. These radiations, called *thermal radiations*, can indicate the temperature levels of the objects emitting them.

Radio Waves. These are the radiations with the longest wavelengths, that is from 50 centimetres to as much as 30 metres. Objects in outer space that emit such radiations are called *radio sources*.

Windows on Outer Space. The atmosphere of the earth is like a sieve which allows only some wavelengths from outer space to reach us. Sunlight forms one group of wavelengths which come down through the atmosphere. This includes not only the visible light but also a part of the invisible light, namely the near ultraviolet (400 to 300 nanos) and the near infrared (700 to 2500 nanos). This is one of the windows that open out on outer space.

The other window is called the *microwave window*. This window covers all wavelengths from one millimetre to 30 metres (see *Atmosphere* infra). The existence of the microwave window was not particularly noticed or studied till 1932 when Karl Jansky of the Bell Telephones announced that he had received radio messages from outer space. (see *Radio Telescopes* infra).

The following Tables indicate the wavelengths of the electro-magnetic spectrum in modern international units.

Table 1
Conversion Table

10 Angstroms	=	1 nanometre
1000 nano	=	1 micrometre
1000 micro	=	1 millimetre
10 milli	=	1 centimetre
10 centi	=	1 decimetre
10 deci	=	1 metre

Table 2
Visible Light: Central Wavelengths

violet	..	..	410 nano
blue	..	..	470 ..
green	..	..	520 ..
yellow	..	..	580 ..
orange	..	..	600 ..
red	..	..	650 ..

Table 3
Short Wavelengths: Ultra-violet

near ultra	=	400 to 300 nano
far ultra	=	300 to 200 nano
extreme ultra	=	200 to 1 nano
X–ray	=	1 to 0.01 nano
Gamma ray	=	Below 0.01 nano.

Table 4
Long Wavelengths: Infra-red

near infra	=	700 to 2500 nano
	=	0.7 to 2.5 micro
intermediate infra	=	2.5 to 50 micro
far infra	=	50 to 1000 micro
	=	50 micro to 1 millimetre

Table 5
Micro and Radio Wavelengths

Micro Wave Region	=	1 millimetre to 500 mm.
	=	0.1 centimetre to 50 cm.
Radio Wave Region	=	Above 50 centimetres.

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† All objects that we know of, have temperatures above Absolute Zero. See *Cryogenics* infra.

3. MODERN ASTRONOMY

Modern astronomy began with the Italian astronomer Galileo. In 1609 Galileo heard of the telescope made by the Dutchman Hans Lippershey. He improved upon it and constructed a similar instrument that could magnify up to thirty diameters.

Optical Astronomy. It was this instrument, known as **refractor telescope,** that opened the field of optical astronomy. Galileo made several startling discoveries. He found the Moon's surface to be rugged, and the Pleiades to contain over 40 stars. He discovered four of Jupiter's moons and observed the sunspots.

In 1668 Newton invented a new instrument, **the reflector telescope**. In a refractor telescope, light is gathered by a large objective lens. In a reflector telescope, a large curved mirror is used for this purpose. Both these types of optical telescopes are still in use.

Growth of Modern Astronomy. The invention of the optical telescope was an epochal event in the history of astronomy. The instrument so caught the fancy of the astronomer and the layman alike, that all advanced countries vied with one another in building bigger and bigger telescopes.

Table 6

Refractor Telescopes

Lens Diameter (Inches)	*Observatory*
40	Yerkes Observatory, Williams Bay, Wisconsin.
36	Lick Observatory, Mount Hamilton, California.
32.7	Observatoire de Paris, Meudon, France.
32	Astrophysikalisches Observatorium, Potsdam, Germany.
30	Allegheny Observatory, Pittsburgh, Pennsylvania.
28	Royal Greenwich Observatory, Herstmonceux, England.
26.5	Universitata-Sternwarte, Vienna, Austria.
26.5	Union Observatory, Johannesburg, South Africa.
26	US Naval Observatory, Washington, D. C.
26	Leander-McCormick Observatory, Charlottesville, Virginia.
26	Royal Greenwich Observatory, Herstmonceux, England.
26	Sternwarte-Berlin-Babelsberg, Berlin, Germany.
26	Astronomical Observatory, Belgrade, Yugoslavia.
26	Tokyo Astronomical Observatory, Mitaka, Tokyo, Japan.
26	Mount Stromio Observatory, Canberra, Australia.
26	Astronomical Observatory of the USSR Academy of Sciences, Pulkova.

Table 7

Reflector Telescopes

Mirror Diameter (Inches)	*Observatory*
236	Academy of Sciences of the USSR, Zelenchukskaya, USSR.
200	Palomar Observatory, Mount Palomar, California.
150	Kitt Peak National Observatory, Tucson, Arizona.
150	Inter-American Observatory, Cerro Tololo, Chile.
150	Mount Stromio Observatory, Canberra, Australia.
140	European Southern Observatory, La Serena, Chile
129	Lick Observatory, Mount Hamilton, California.
120	European Southern Observatory, La Serena, Chile.
107	McDonald Observatory, Fort Davis, Texas.
104	Crimean Astrophysical Observatory, Nauchny, Crimea, USSR.
100	Mount Wilson Observatory, Pasadena, California.
98	Royal Greenwich Observatory, Sussex, England.
90	Steward Observatory, University of Arizona, Tucson, Arizona.
88	Institute for Astronomy, University of Hawaii, Mauna Kes, Hawaii.
84	Kitt Peak National Observatory, Tucson, Arizona.
82	McDonald Observatory, Fort Davis, Texas.

Radio Astronomy. Radio Astronomy came into being in the most unexpected manner. In 1931, Karl Jansky, an American radio engineer, working in Bell Telephone Laboratory, noticed a steady stream of

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Radio Astronomy Centre, Ootacamund

by

Dr. V. R. Venugopal, Scientist in charge

One of the largest radio telescopes in the world is located amidst picturesque surroundings near the village Muthorai, about 9 km from Ootacamund town in the Nilgiris District. This telescope which was designed and fabricated indigenously with Indian resources only is operated by the Tata Institute of Fundamental Research (TIFR), Bombay. Funds for the entire project were provided by the Department of Atomic Energy of the Government of India. The lands where the telescope and laboratory building are located have been granted by the Tamil Nadu Government. The telescope, which became operative in Feb. 1970, is being used for fundamental research in radio astronomy.

The design of the Ooty radio telescope is a novel one which utilises to the best advantage the geographical situation of S. India—proximity to the equator and the hilly terrain of the Nilgiris which provided a natural hill slope of about 11° in the north-south direction. Since the geographical latitude of the site where the telescope is located is close to 11°, the installation of the telescope on this hill slope ensures that the axis of the telescope is parallel to the Earth's axis. This arrangement enables the tracking of a radio source for about 10 hours in the east-west direction. The telescope is 530m long in the north-south direction. It consists of 24 parabolic frames each 30m wide supported on 24 equidistant tall steel towers. The reflecting surface of the telescope for radio waves is formed by means of 1100 stainless steel wires each of diameter 0.38mm running along the length of the parabolic cylinder. The telescope is fully steerable—the rotation in the east-west is effected mechanically and in the north-south by electrical steering of the beam of the telescope.

The telescope operates at a frequency of 326.5 Megahertz (equal to a wavelength of about 92 centimetres). The effective collecting area of the telescope is about 8000 square metres. This large collecting area along with the low noise electronic receiver system which is also designed and constructed indigenously by the scientists and engineers of TIFR makes the Ooty radio telescope a very sensitive one operating at metre wavelengths. Because of its high sensitivity it is capable of detecting very weak radio sources in the sky.

Since information on detailed structure of radio sources at metre wavelength was very scant in astronomical literature, TIFR scientists designed the fully steerable large radio telescope in the form of a parabolic cylinder for detecting and studying radio sources by the technique known as 'Lunar Occultation'. In this technique the disappearance of a radio source behind the moon and its reappearance from behind the moon are recorded. These observations are used to determine the accurate positions of the radio sources, their angular sizes and the intensities of radiation emitted by the sources. The data obtained during the last ten years of operation of the telescope have contributed significantly to the understanding of the physics of the radio sources and to cosmology in general. The lunar occultation observations occupy the telescope for 10 hours every day. The rest of the time on the telescope is utilised for other astronomical studies such as search and study of pulsars, interplanetary scintillation observations of radio sources etc.

There are around the world parabolic dish type radio telescopes of high surface precision operating at millimetre wavelengths and radio telescopes of various designs operating at metre wavelengths. Another type of radio telescope by which very high resolution and high sensitivity are achieved is the Aperture synthesis or super synthesis telescope. The largest such telescope is the very Large Array near Socorro in New Mexico, USA.

The development plans at the Ooty radio astronomy centre envisage setting up of a synthesis radio telescope operating at 326.5 MHz. When completed this will be the largest synthesis radio telescope operating at metre wavelengths.

radiation coming in from outer space. It is strange that professional astronomers of the time paid little attention to this discovery. However, it attracted the attention of an amateur radio operator in U.S., Grote Reber, who set out by himself to learn more about this extraterrestrial phenomenon. He worked single-handed for nearly ten years, studying the sky and analysing radiations. In 1937, he built the world's first *radio telescope*—a 31-feet 5-inches parabolic dish—and set it up in his backyard at Wheaton, Illinois. In 1940 he produced a radio map of the sky, the first of its kind in the world. Thus a new branch of astronomy was opened—Radio Astronomy.

The radio telescope is in many ways analogous to the optical telescope. It consists of a large metal reflector fitted with an antenna. The metal reflector collects and focuses radio energy on the antenna which can be tuned to any desired frequency. A sensitive radio receiver picks up the radiation from the antenna and records it. This is analysed in a computer and studied.

All types of radiated energy are electromagnetic in nature. They differ from one another in wavelength and frequency. Much of the radiation like X-rays, gamma rays, ultraviolet rays and the like are absorbed by the atmosphere and reflected back into space. All the same, a persistent stream of radiation reaches the earth. This includes a steady, weak but quite perceptible background radiation called *continuum radiation* which is being received from all parts of the universe. Recent research has shown that this background radiation may perhaps hold the key to the formation and destruction of stars and galaxies.

Table 8

Large Radio Telescopes

Location	Description	Approximate Effective Area in Square metres	In operation since
Jodrell Bank Manchester, U.K.	Dia. 76 m parabolic dish	3×10^3	1957
Green Bank, West Virginia, USA	Dia. 92 m Parabolic dish	4.5×10^3	1962
Parkes, Australia	Dia. 64 m Parabolic dish	2.3×10^3	1962
Arecibo, Puerto Rico	Dia. 300 m Spherical dish	3×10^4	1963
Green Bank, West Virginia, USA	Dia. 42 m Parabolic dish	1×10^3	1965
Lake Traverse, Ontario, Canada	Dia. 46 m Parabolic dish	1.1×10^3	1966
Ootacamund, India	530 m NS × 30 m EW Parabolic Cylinder	8×10^3	1970
Effelsburg, West Germany	Dia. 100 m Parabolic dish	5.5×10^3	1672
Zelenchukskaya, North Caucasus, USSR	Ratan 600, 895 panels mounted on a circle of dia 576 m.	1.4×10^3	1974

Other Astronomies. In the sixties satellite technology took astronomical investigations farther afield. Until then astronomical studies were entirely ground-based. Now satellites made it possible to study astral phenomena from above the atmosphere. Thus astronomy came to be studied from two levels—from the ground and from above the atmosphere. This led to the emergence of many specialised fields in astronomy—X-ray, Ultraviolet, Gamma-ray and Infrared.

X-ray Astronomy. It has long been known that the sun emits X-rays. But the first X-ray source beyond the sun, that is, outside the solar system was discovered as late as 1962 (in a rocket experiment) in the constellation of Scorpius. Named Sco X-1, it is the brightest X-ray star in the sky. It is truly an X-ray star since it emits 99.9 per cent of its radiation in X-rays.

Organised research in this field was initiated only in 1970 with the launching of the X-ray satellite UHURU (a Swahili word for freedom). This satellite was launched from San Marcos Island, off the coast of Kenya. Uhuru has discovered quite a number of X-ray sources, as many as 400 by 1976. Among X-ray sources in our galaxy, the most important are: 1) Stars suspected to be Black Holes, Cyg. X-1, for instance (See S. 9); 2) Remnants of supernova explosion like the Crab nebula (See S. 9); 3) Groups of hot young blue stars, called OB Associations. This is a discovery made by the satellite-borne Einstein Observatory quite recently; 4) Quasars; 5) Other sources like Seyfert galaxies which emit profusely in the X-ray region. Outside our galaxy, the Andromeda galaxy has been found to contain a number of X-ray sources. Taken together the various X-ray telescopes operating above the atmosphere had identified and catalogued about 1000 X-ray sources by 1980.

But perhaps, the most significant contribution of X-ray astronomy is in the study of inter-galactic gases, which have so far eluded close scrutiny. There is evidence that the entire space between galaxies is filled with very hot gases with temperatures going up to tens of millions of degrees. "The cosmological significance of this is that the amount of matter in the universe will determine the future evolution of the universe". (see *Science Today*, June, 1979).

Ultra Violet Astronomy. Ultraviolet astronomy is confined to wave lengths between 912 Å and about 3000 Å (S. 2). The first successful observation in the UV region of the spectrum was made in 1946, when the Naval Research Laboratory, USA, flew a captured German V-2 rocket. The first successful detection of far ultraviolet radiation outside the solar system was also made by the Naval Research Laboratory in 1955 with the help of an *Aerobee* 25 rocket. Ultraviolet astronomy is especially useful in many cases where other techniques have failed to bring in any worthwhile information. Thus there are many young massive stars with effective surface temperatures of 10,000 K which emit mostly in the ultraviolet region. These stars can be properly studied by ultraviolet astronomy only.

Gamma Ray Astronomy. Gamma rays have the shortest wavelengths and are the most energetic rays so far known. Because of their great penetrating power, they are not absorbed by the inter-stellar matter and therefore reach us almost unchanged from all parts of the universe.

Gamma ray astronomy was born in 1968 with the discovery of very hard gamma ray radiation from the central region of our galaxy, by a team of scientists at the MIT,† USA, who had flown a sophisticated gamma ray detector on board the Orbiting Solar Observatory-3 satellite. Subsequent observations on celestial hard gamma rays from experiments on the US Small Astronomy Satellite-2 and European COS-B satellite have established gamma ray astronomy as an observational science.

Gamma rays react with cosmic rays, inter-stellar matter, magnetic fields and low energy photons. These are wide ranging reactions. A better understanding of these reactions will provide a clearer view of the cosmos.

During the last few years some 27 new hard gamma ray sources have been discovered. Of these, 2 are extra galactic, that is outside our galaxy.

Infra Red Astronomy. Infrared astronomy is important because it enables us to observe objects at temperatures between about 10 K and 2000 K, whether they are cool stars or dust cloud (S. 2). In the solar spectrum the region nearest to the visible red is called the near infrared (S. 2). A portion of this near infrared can be detected with special photographic plates. Hence this part of the infrared is called the *photographic infrared*. Higher wave lengths can be detected by other methods.

The IR (infrared) telescope is quite similar to the optical telescope. In fact, optical telescopes are commonly used as IR telescopes by the addition of appropriate detectors. The sun, moon and the planets emit abundantly in the infrared region and provide us a lot of information through IR telescopes.

Star-forming clouds where 'proto stars' are taking shape are particularly rich in infrared radiation because the surface temperature is very low making them quite visible in the infrared.*

Radar Astronomy. Radar astronomy was born in 1940, when a Hungarian physicist Zoltan Bay sent out a beam of micro waves to the moon and detected the return echo. The basic principle is simple. Short pulses of high frequency radio energy are aimed at a target, from which the pulses are reflected to the earth, where they are picked up by a sensitive antenna receiver system. We know beforehand the speed at which radar pulses travel, so that the time between their transmission and reception can be converted into a measure of distance.

Radar astronomy is really a part of radio astronomy since micro waves can rightly be considered a part of the electromagnetic spectrum.

Radar techniques in recent years have substantially added to the stock of our knowledge of astronomy. The surface of Venus, for example, is covered by a thick layer of clouds against which our optical telescopes were quite helpless. But micro waves have pierced through the clouds and have sounded the solid surface of Venus. The first readings showed a high mountain range. Subsequent readings have helped us to make a radar map of the surface. Various bits of information about other planets have been and are still being collected by radar readings.

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† Massachusetts Institute of Technology.

* See Box *Orion Molecular Complex*.

Table 9

Radar Astronomy Systems

Antenna Diameter (feet)	*Observatory*	*Peak Transmitted Power (Kilowatts)*
1000	Arecibo Ionospheric Observatory, Arecibo, Puerto Rico	2500
250	Jodrell Bank, Macclesfield, England	
120	Haystack Lincoln Laboratory, Massachusetts Institute of Technology, Tyngsboro, Massachusetts	400
85	Jet Propulsion Laboratory, Goldstone Lake, California	100
84	Millstone Lincoln Laboratory, Westford, Massachusetts Institute of Technology, Westford, Massachusetts	5000
50(8)	Crimean Deep Space Tracking Station, Crimea, USSR	60

4. THE WORLD OF SOUND

Radio Telescopes have opened a new world to the astronomer—a world of sound, not of sight. The two worlds are fantastically different. The Milky Way, for example, is a river of light to the eyes but it is a hissing mass to the ears. Radio telescopes, in fact, help us to listen in to stars or galaxies that lie far beyond the ken of the world's largest optical telescopes. They also enable us to study astral phenomena which are within the range of our optical telescopes but which are not visible owing to the haze of cosmic dust. Thus it is that we have managed to collect what little we know about the galactic centre of the Milk Way. (see the *Milky Way).*

Sound is produced by the vibrations of an object or mechanism and transmitted in the form of waves—alternating increase and decrease in pressures. It radiates outward through a material medium of molecules, more or less like the ripples spreading out on water after some heavy object has been thrown into it. The frequency of sound is determined by the number of times the vibrating waves undulate per second. The slower the cycle, the lower the pitch. The pitch becomes higher as the cycles increase in number or, which is the same thing, as frequencies increase.

Ultra-sonics. The human ear cannot generally hear sounds of frequencies higher than 20,000 vibrations per second or in modern International Units 20,000 Hz. (see *International Units* infra). Sounds of frequencies higher than 20,000 Hz which are inaudible are called *ultra-sonic.* Bats produce very high sound when they fly but they are at ultra-sonic frequencies from 20,000 to 100,000 Hz. So we cannot hear them. Ultra-sonic waves are an important tool of research in physics. There are also many applied uses for ultra-sonic waves, like submarine echo sounding, detection of flaws in casting, drilling glasses and ceramics, emulsification etc.

Speed of Sound. The speed of sound varies according to the nature of the carrier media. When we speak of the speed of sound, we ordinarily mean the speed at which sound travels in air at sea level. This is around 1088 feet per second. In water, sound travels about 5 times faster than in air. In iron and steel it is even faster, about 3 times faster than the speed in water. Speeds of sound through some selected media are indicated below: *ice-cold water*—4938 ft. per second, *brick*—11,620 ft., *granite*—1296 ft., *hardwood*—12,620 ft. and *glass* 16,410 to 19,690 feet per second.

Super-Sonics. Supersonic speed is speed greater than the speed of sound (in air at sea level), that is to say, around 760 miles per hour. Supersonic speed is measured in *Mach.* This unit was worked out by the Czech-born German physicist *Ernst Mach* and therefore named after him. Mach is the ratio of the speed of flight to the speed of sound, under the same conditions of pressure and density. When a plane moves at the speed of sound, it is Mach 1. When a plane moves at twice the speed of sound (supersonic), it is Mach 2. When it is less than the speed of sound it is *sub-sonic* and therefore lesser than Mach 1. At half the speed of sound it is Mach ½.

Sound barrier. Sound barrier is the point at which the speed of flight equals the speed of sound. When a plane flies faster than sound, it is said to cross the *sound barrier.* When the sound barrier is passed, the speed of the aircraft produces shock waves in the atmosphere, somewhat like the bow waves produced by fast-moving ships. The shock waves in the atmosphere produce booms like thunder claps. These are called *sonic booms*. The sonic booms jar on the ears of the resident population in the areas over which the plane flies but they do not trouble the passengers or the crew because the plane goes faster than the shockwaves which are, in a manner of speaking, left behind.

Decibels. The loudness of the sound reflects the pressure of the sound waves. This pressure is expressed in decibels (db). A decibel (one-tenth of a *bel*) is a physical unit based on the weakest sound that can be detected by the human ear. It is named after A. G. Bell, the inventor of the telephone. The decibel scale is logarithmic, that is, an increase of 10 db means 10 times as much, an increase of 20 db means 100 times and 30 db 1000 times etc. A light whisper may be about 10 db, a quiet conversation around 20 db and normal talk 30 db. In comparison the electrically amplified beat music in a disco is a billion times louder than the sound of a whisper at 10 db. (see Box *Noise Scale*).

Danger Zone. The human ear can safely respond to pressures up to 120 db. Any intensity higher than this is harmful and can conceivably damage the ear. This would be clear, if we examine the functioning of the ear.

The Ear. The ear consists of three parts, the *outer ear*, the *middle ear* and the *inner ear*. The outer ear (*auricle*) collects the sound stimuli. These are carried through a canal to the middle ear. The canal is not straight and is widest where it meets the outer wall of the middle ear, the ear drum. The sweat glands of the canal are modified to secrete a kind of wax—the ear wax. The middle ear is a cavity in the temporal bone which is a part of the skull. The *tympanic membrane* or the ear drum receives the sound vibrations from the outer ear. Three minute pieces of bone bridge the cavity, the *hammer*, the *anvil* and the *stirrup* (so called from their shapes). These transmit the vibrations received by the middle ear to the inner ear. The inner ear is a small but elaborate structure which houses two distinct organs—one for hearing and the other for balance. The organ for hearing, called the *cochlea* is a snail-shaped container which transmits sound vibrations as nerve impulses to the brain. It is the brain that initiates the entire system of varied bodily responses to sound.

Thus, the brain activates the pituitary gland which in turn causes the thyroid and adrenal glands to excrete hormones. It stimulates the sympathetic nervous system which influences the heart, the stomach, the pupil, blood vessels and motor nerves which control muscle reactions. These and other reactions determine our bodily responses to sound.

A common misconception is that the ear gets accustomed to excessive noise if it is heard *continually*. Actually what happens is that the ear progressively loses its sensitivity and ability to transmit sound vibrations to the brain resulting in various degrees of deafness. Such disabilities become markedly noticeable in old age.

Noise Pollution. Sound is either music or noise—so goes an old saying. What is implied by this distinction is that whatever is pleasant to the ear is music while all that is unpleasant is noise. Such phrases as 'grating on the ears' or 'jarring on the nerves' express the discomfort we feel on hearing unpleasant sounds. It is such unpleasant impacts of sound that are collectively described as *noise pollution*.

All cities and towns labour under noise pollution in varying degrees. The worst offenders are the big cities, whose noisy

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Noise Scale

1. *Breathing*	*10 db*
2. *Wind in the trees*	*20 db*
3. *Quiet Conversation*	*20-30 db*
4. *Ticking Clock*	*30 db*
5. *House in a quiet street*	*35 db*
6. *Radio Music*	*50-60 db*
7. *Loud conversation*	*60 db*
8. *Office noise*	*60 db*
9. *Children playing*	*60-80 db*
10. *Lawn mower*	*60-80 db*
11. *Vacuum cleaner*	*80 db*
12. *Traffic Noise*	*60-90 db*
13. *Sports car*	*80 95 db*
14. *Heavy truck traffic*	*90-100 db*
15. *Motor Cycle*	*105 db*
16. *Pneumatic drill*	*110 db*
17. *Thunder storm*	*110 db*
18. *Beat Music (electrically amplified)*	*120 db*
19. *Aircraft noise*	*90-120 db*
20. *Jet takeoff (at 100 m distance)*	*120 db*
21. *Jet engine (at 25 m distance)*	*140 db*
22. *Space Vehicle launch (from a short distance)*	*140-170 db*

traffic itself is a potent menace to hearing. A study recently conducted in West Germany showed that 2.5 million people (out of nearly 63 million) live in places where the noise level is high. This is a small percentage, as percentages go, but it indicates only those who are exposed to the greatest danger. It does not mean that others are unaffected by noise pollution. Even noises at much lower levels can be harmful, especially during sleep and recuperation. Anything that disturbs the repose of sleep is detrimental to health in the long run. Barking dogs and fighting cats can interfere with sleep whether in the town or in the country.

During work hours noise is definitely a deterrent to concentration. From 50 db onwards noise can interfere with normal voice communication. At 70 db even normal conversation becomes impossible. However, some people have become so accustomed to noise that they cannot concentrate on their work in the absence of familiar sounds like the radio. May be, these people do turn out better work in a noisy environment but they are heaping up trouble for the future. The constant exposure to noise will steadily deteriorate the delicate parts of the middle ear, which would fail more and more in transmitting sound impulses to the inner ear, ultimately resulting in inefficient bodily responses to sound.

Ultrasound In Medicine. Ultrasonic beams for diagnosis of internal diseases were first used in cardiology in 1953. The credit for this goes to a Swedish cardiologist Dr. Inge Edler. Heart surgery had just started and there was hardly any satisfactory method to ascertain the condition of the heart before surgery. X-ray could give little helpful information. Dr. Edler therefore sought the assistance of a Swedish physicist. At that time there was in use an ultrasonic device to detect flaws in castings and weldings. This device was suitably adjusted to check the flaws in the human heart. It proved successful and was quickly taken up by cardiologists all over the world. The ultrasonic diagnosis of the heart gives us an echo-cardiogram. This echo-gram technique was extended to all kinds of internal diseases.

The simplest device for ultrasonic diagnosis is known as A-scope. The A-scope has clinical applications in neurology, ophthalmology and internal diseases of many types. It enables the physician to measure the depth of the echo-producing surface and to analyse the characteristics of the echoes received.

Ultrasonic beam consists of a train of pulses that are emitted about a thousandth of a second apart. The ultra-sonic beam behaves much as the radar does. Each pulse which is shaped like a tear-drop travels in the beam at the speed of sound and is echoed back by the internal organs. The strength of the echo indicates the nature of the tissues through which the beam passes. If the tissues are soft the echoes are low, if they are hard or bony the echoes are much greater. The echoes sent by the ultrasonic pulses can be recorded and kept for further reference.

Already ultrasonic scanning has proved itself superior to other methods like X-ray scanning in Obstetrics (Pregnancy and delivery) and Gynaecology (diseases peculiar to women). Ultrasonic beams can show very early whether a woman is pregnant or not. They can also identify various pregnancy troubles like excess of amniotic fluid, absence of brain in the foetus and faulty development of pregnancy. They are also useful in locating internal cysts, abscesses and cancers of the liver and to identify aneurysms (bulging of the arteries) particularly of the abdominal aorta. Since ultrasound probes the interiors of glands it can detect abnormal conditions such as tumours or inflammation of the prostate gland. They can also identify breast cancers early enough to bring them under control.

5. GALAXIES

Galaxies are huge congregations of stars that hold together by force of gravity. They are so big that they have sometimes been called 'island universes'. When the expanding material of the universe broke up in the first instance, billions of islands of gaseous matter were formed in space. These gaseous islands or *Proto-galaxies* rotated, each with its own speed of rotation. Those with very low rotational speeds assumed nearly spherical shapes. Others assumed elliptical forms, with varying degrees of elongation, depending on their rotational speeds. Most of these gaseous islands, however, had such high rotational speeds that their bodies were flattened out into the shape of discs, from whose edges spiral arms streamed. The centre of the galactic disc was formed by a multitude of proto-stars rotating on regular circular orbits around the centre of the galaxy, whereas the spiral arms were formed by highly diluted, dusty gas streamers which were caught in the general rotation and were twisted into the shape of spirals. The galaxies have thus come out in different shapes and sizes.

As the gaseous islands were settling down, local condensations—*proto-stars*[†] developed at many points within the galaxy. These condensations began to contract under their own weight into dense gas spheres. As a result of this contraction, the temperature of the gas spheres rose steadily and their heated surfaces began to emit heat waves and then the shorter wavelengths of visible light. As the central atmosphere of these contracting proto-stars reached the ignition point—say 10 million degrees centigrade—contraction stopped, thermonuclear reactions began and millions of bright burning globules of gas emerged—the stars. When the stars appeared, the originally cool and dark proto-galaxies were transformed into the bright stellar galaxies that they are today.

Structure and Composition. A structural analysis of the known galaxies brings out three major forms—*Spiral*, *Elliptical* and *Irregular*. Spiral galaxies have a central nucleus with great spiral arms trailing round it. The Milky Way and the Andromeda Galaxy belong to this group. A special type of spiral galaxies is what are called *barred spirals* which have a central bar as a nucleus. The spirals comprise some 80 per cent of the galaxies so far known. Elliptical galaxies show purely elliptical shapes without any spiral arms. They range in shape from spherical ellipticals to extremely saucer-shaped ones and account for about 17 per cent of the known galaxies. Irregulars, as the name suggests, show no definite geometric pattern or shape.

It has been suggested that irregular galaxies are youthful galaxies, while spiral galaxies represent middle age and elliptical galaxies old age.

Peculiar Galaxies. Most of the galaxies show some sort of regularity and symmetry that enable us to classify them. But one or two per cent stand out as peculiar. These galaxies, no doubt, can be counted as irregular galaxies as mentioned above. But their irregularities are so unique and their eccentricities so bizzare that it is best to classify them as *Peculiar Galaxies*.

The first peculiar galaxy was noticed in 1917. It appeared to be a double nebula with long curving tails. In the New General Catalogue (N. G. C.) of 1888, they were numbered as nebulae 4038 and 4039. In 1921 when the photographs of these nebulae were scrutinised, it was found that they sent out long curving filaments which resembled the antennae of an insect. The system has since become known as *Antennae*. The Antennae is about 50 million light years from our galaxy, which among galaxies is not a great distance. Only about 1000 easily recognised galaxies lie closer to ours.

Another pair resembling the Antennae is N. G. C. 4676 A and 4676 B, nicknamed the *Mice*. One of the pair sends out a long straight tail and the other, a curved tail. Another wellknown pair is the *Whirlpool* galaxy and its companion (M. 51). N.G.C. 3921 is yet another peculiar galaxy, without any companion at all. It sends out a number of streamers that look like long

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Orion Molecular Complex (OMC)

This is the name by which the star-forming cloud in Orion (see S. 9) is known among astronomers. Stars are formed in dense interstellar clouds first as protostars (see S. 4). At this stage, they shed no light but are visible in the infra red region. The OMC is the nearest star-forming cloud (to us) being around 1500 light years away. The core of the cloud is around 2 light years across and contains (1) ionised gas with a density of 10,000 atoms per cubic centimetre, (2) a cluster of hot massive luminous stars, (3) a dense cloud of molecular gas of high density, (4) a cluster of infra red stars which are optically invisible and (5) exotic objects spewing out intense waves of micro wave radiation called 'maser emission'.

It was in this cloud complex that the first claim for the discovery of a proto star emitting profusely in the infra red was made in 1967. This young infra red object emits infra red radiation, equivalent to 10,000 times the total radiation from the sun, but is completely dark in the optical region. This is often referred to as the BN object after its discoverers Becklin and Naugebauer.

[†] See Box *Orion Molecular Complex.*

tails but no second galaxy has been noted anywhere in its vicinity.

Cluster of Galaxies[*]. Most of the observable galaxies seem to be scattered in space more or less at random but there are numerous cases of galaxies clustering into groups, which may contain as many as several hundred individual galaxies. Our own galaxy, the Milky Way, belongs to a cluster of some 24 galaxies called the 'local group'. This group covers an area of about 3 million light years in diameter.

The two nearest galaxies are the Large Magellanic Cloud and the Small Magellanic Cloud, so called after the world navigator Magellan who first spotted them. The Large Cloud is about 155,000 light years from us with a maximum diameter of some 40,000 light years and contains some 5 to 10 billion stars. The Small Cloud has only a population of 1 to 2 billion stars.

The two largest galaxies in the group are the Milky Way and the Andromeda Galaxy, both of them spiral. Andromeda galaxy (M 31) is of special interest to us, because it appears that our galaxy and M 31 are actually approaching each other at a rather modest speed, some 50 km per second.

Local Group. The Local Group is a term loosely applied to indicate our galaxy and its nearby galaxies. The Group now (1980) numbers around two dozen. Some like the *Maffei* are even suspected to be outside the group.

The latest known member of the group is a *dwarf galaxy* discovered by the Siding Spring Observatory in Australia. It is in Carina and consists of a loose swarm of very faint stars. In appearance it resembles the Sculptor and the Fornax systems. It is estimated to be about 500,000 light years away.

The following table gives the names and/or numbers of these galaxies, with their apparent magnitude, absolute magnitude, diameter and distance in *kiloparsecs* (thousand parsecs).[†]

Table 10

Galaxies

Galaxy Name or Number	*Visual[‡] magnitude*	*Distance (kilopsc)*	*Diameter (kilopsc)*	*Absolute magnitude*
The Milky Way	..	..	30	(-21)
Large Magellanic Cloud	0.9	48	10	–17.7
Small Magellanic Cloud	2.5	56	8	–16.5
Ursa Minor system	..	70	1	(9)
Sculptor system	80	83	2.2	–11.8
Draco system	..	100	1.4	(-10)
Fornax system	8.3	190	6.6	–13.3
Leo II system	12.04	230	1.6	–10.0
Leo I system	12.0	280	1.5	–10.4
NGC 6822	8.9	460	2.7	–14.8
NGC 147	9.73	570	3	–14.5
NGC 185	9.43	570	2.3	–14.8
NGC 205	8.17	680	5	–16.5
NGC 221 (M 32)	8.16	680	2.4	–16.5
IC 1613	9.61	680	5	–14.7
Andromeda galaxy	3.47	680	40	–21.2
NGC 598 (M 33)	5.79	720	17	–18.9
Maffei I	11.0	1000	..	–19.0

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[*] There is an unfortunate confusion of terminology between *Clusters of galaxies and galactic clusters*. The latter are the clusters of stars within the spiral arms of the galaxies. (See *Constellations* infra).

[†] A *parsec* is equal to 3.26 Light Years.

[‡] For Visual and Absolute magnitudes, see *Magnitudes*-infra.

6. THE MILKY WAY

The Milky way is our home galaxy. A peculiar feature of this galaxy is a bright band of light that runs almost in a perfect circle through it. As seen from the earth this band looks like a river of light flowing through the sky. Actually it is made up of millions of scintillating stars which from this distance seem to be placed in close proximity to one another. Modern westerners have called this river of light the Milky Way. This name is now applied to the galaxy as a whole.

The Milky Way had so fascinated our ancestors among all nations that they had given it pretty names and had woven fanciful legends about it. The Yakuts of Central Asia called it the footprints of God and the Eskimos the path of white ashes. The ancient Greeks called it the road to the palace of the Heavens, the Chinese, the celestial river and the Hebrews, the river of light. The ancient Indians, not to be outdone, called it the Akash Ganga or the Celestial Ganges.

Akash Ganga. Legend has it, that in response to the insistent prayers of a devotee Bhagiratha, God Siva brought the Akash Ganga down and allowed a trickle of it to fall on the Earth. This trickle formed the earthly Ganga (River Ganges), which thus remains, even today, sacred to Hindus all over the world.

The Milky Way is a spiral galaxy. The main body of the galaxy is a disc 100,000 light years across with a globular nucleus of about 16,000 light years in diameter, and far-stretching spiral arms (in one of which our solar system is located). The galaxy consists of over a hundred billion stars rotating about the centre in a stately average period of some 230 million years.

The principal gravitational force that controls this rotation is produced by the star clouds at the centre which have a total mass of about 50 billion suns. The mass of the entire Milky Way is calculated to be a little more than 100 billion times the mass of the Sun.

The stellar population of the Milky Way is made up of three categories of stars. First, there are the stars in the hub and spirals of the Milky Way. The sun belongs to this group of stars. These groups are called *Open or galactic clusters* (see *Constellations)*. Beyond the disc and the open clusters, lie the halo stars. Many of these stars form miniature galaxies, containing tens of thousands of stars. These are called *globular clusters*. They contain very old stars. Beyond the globular clusters there are several million individual stars, that run round rakishly on the outskirts of the Milky Way. All these form part of the galaxy.

Re-shuffling of Stars. The stars in the galaxy are being continually reshuffled. In the course of a million years, two stars now close together but having a difference in velocity of one kilometre per second, will have separated by 3 light years. Therefore, in less than one *cosmic year*† (250 million years), some groups of stars may disintegrate and new groups of stars may form. The physical make-up of the galaxy is also likely to change over intervals of the order of a cosmic year.

Galactic Nucleus. The centre or the nucleus of our galaxy is so completely obscured by dust clouds that we cannot learn anything about it through optical telescopes. What little we know about the nucleus has been collected by radio telescopes.

Our galactic nucleus is about 32,000 light years from the Sun. It appears to be a rotating disc of gas. In this rotating disc massive activities are going on. One such scene of activity is very near the centre of the galaxy. Here, new stars are being born continually. The area is already crowded with full grown stars. The stellar density here is of the order of a million stars per cubic parsec (3.26 light years). It means that while we on earth, can see only one really bright star (Sirius) at night, any watcher in the central disc can see a million stars like Sirius, with a total luminosity of about two full moons. That is to say, the centre of our galaxy is perpetually flood-lit.

Dr. Joseph Weber of the University of Maryland thinks that a Black Hole* dominates the centre of our galaxy. One of his experiments showed powerful gravity waves emanating apparently from our galactic centre. Strong gravity waves are generally associated with Black Holes. It is therefore quite possible that a Black Hole is holding our galaxy in its murderous grip.

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† See *The Sun* infra.

* See *Life of a Star* infra.

7. STARS

Stars account for 98 per cent of the matter in a galaxy. The rest 2 per cent consists of interstellar or galactic gas and dust in a very attenuated form. The normal gas-density between stars (interstellar gas) throughout the galaxy, is about one-tenth of a hydrogen atom per cubic centimetre (cm^3) volume.

Stars tend to form groups. Lone stars going on their own are the exception rather than the rule in the universe. Single stars do not number more than 25 per cent of the stellar population. Double stars account for some 33 per cent. The rest are multiple stars. Antares in Scorpio is actually two stars. Capella and Alpha Centauri comprise three stars each, while Castor consists of six stars.

Binaries. Stars which appear single to the naked eye are sometimes found to be double stars or binaries in the telescope. These are two stars revolving around a common centre of gravity. They are found in orbital motion round each other, in periods varying from about one year to many thousands of years.

Red Giants. When the hydrogen in a star is depleted, its outer regions swell and redden. This is the first sign of age. Such stars are called Red Giants. Our star, the Sun, is expected to turn into a red star of this type in another 5 billion years. (see *Sun* infra).

Red Giants are appropriately named. They have gigantic dimensions. Betelgeuse, for example, has an actual diameter of 300,000,000 miles, about 350 times the diameter of the sun. Mira, another red giant, has a diameter of 400,000,000 miles.

Variable stars. These are stars that show varying degrees of luminosity. *Delta Cephei*, the first of this type of stars, was noticed in 1784 by the deaf and dumb English astronomer John Goodriche. He found that Delta Cephei had a regular fluctuation of brightness every 5 days and 9 hours. Stars of fluctuating luminosity, thus came to be called *Cepheid Variables*. In stars of this type, high luminosity fluctuates between periods as small as a few hours to as long as a 1000 days or more. Generally speaking, the slower the bright-dull-bright cycle, the higher is the luminosity.

Novae and Supernovae. These are stars, whose brightness increases suddenly by 10 to 20 magnitudes or more and then fades gradually into normal brightness. The distinction between the two types has not been precisely explained. It would appear that they differ in degree and not in kind. The sudden increase in brightness is attributed to a partial or outright explosion. In novae, it seems that only the outer shell explodes, whereas in supernovae the entire star explodes. Novae occur more frequently than supernovae.

Supernovae. Supernovae are stars whose brightness increases to 20 magnitudes or more. As Prof. C. F. Powell puts it, "The whole structure of the star is blown to pieces; it flares up in brilliance, so that its intrinsic luminosity for the first thirty days following the explosion is equal to about 1000 million of our suns."

About one star in 100 explodes like this. In our galaxy of some 100 billion stars, a supernovae explosion may occur once every hundred years. An exploding star or supernova releases more energy than a billion suns and ejects a lot of matter into space, at a velocity very near to the velocity of light. Some supernovae may leave a super dense core which rotates at high speed and may thus transform itself into a pulsar.

Four supernovae had been identified in historical times, all before the invention of the telescope. They were noted in 1006, 1054, 1572 and 1604.

The 1006 and 1054 supernovae were identified by oriental astronomers. The 1006 supernova appeared towards the end of April 1006, in the constellation of Lupus. Initially, the star was as bright as Venus. It continued to be visible at night, for longer than a year. Although no visible remnant of this supernova is traceable, radio emissions from its remnant were identified in 1965. The 1054 supernova, of which detailed descriptions survive in Chinese chronicles, is described "as a guest star". It is said that this supernova outshone the sun for many days and turned night into day. The Crab nebula is taken to be the remnant of this supernova.

Table 11
Nearest Stars

Name/Number	*Distance (light years)*	*Magnitude**	
		Apparent	*Absolute*
Proxime Centauri	4.2	10.5	15.5
Alpha Centauri	4.3	0.06	4.7,6.1
Barnard's Star	6.2	7.7	13.4
Lalande 21185	8.0	7.6	10.7
Wolf 359	8.1	13.5	16.5
Sirius A	8.7	−1.58	1.3
Inne's Star	9.6	11.7	14.4
B.D.-12 degrees 4523	9.9	9.5	12.1
Kapteyn's Star	10.2	9.2	11.7
Ross 248	10.2	13.8	16.3
Ceti	10.2	3.6	6.1
Procyon	10.4	0.48	3.0
Eridani	10.5	3.8	6.3
61 Cygni	10.7	5.6	8.0
Lacaille 9352	11.2	7.4	9.7
2398	11.3	8.8	11.1
Groombridge 34	11.6	8.1	10.4
Indi	11.6	4.7	6.9
Kruger 60	12.5	9.3	11.4
Van Maanen's Star	12.8	12.3	14.3

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* See Magnitudes infra.

The supernovae of 1572 and 1604 were noted by two European astronomers, Tycho

Brahe and Johannes Kepler. According to Tycho, the 1572 supernova was brighter than any other fixed star and even brighter than Jupiter. The remnant of this supernova was not traced until 1952. Later, the remnant was located, as a strong source of X-rays. The supernova of Kepler (1604) attained a brightness equal to, if not greater than, that of Jupiter. It was visible by day for a month and by night for a whole year. The remnant of this supernova has also been identified as a radio source.

The most recent supernova explosion in our galaxy took place in 1700 in the constellation of Cassiopeia. Strangely enough, this explosion had not been noticed by any astronomer. This supernova was identified in 1948 from its relic, an intense radio source named Cassiopeia A.

The cause of a supernova explosion is still in dispute. But most astronomers attribute it to the instabilities in the structure of the star, when the supply of nuclear fuel, in the core of a star is exhausted. These instabilities, however, develop only in stars greater than about one and a half times the Sun. Stars which are smaller than that turn into white dwarfs.

8. MAGNITUDES

Magnitudes represent a measure of brightness. *Apparent* magnitude is the measure of brightness (visual magnitude) which is observed from the earth. *Absolute* magnitude is the brightness which a star would have at 10 parsec's distance. (A parsec is equal to 3.26 light years).

Classification of stars by magnitudes or by a scale of brightness was first made by Hipparchus, a Greek, in the second century B. C. He divided stars into 6 groups according to degrees of brightness, observable by the naked eye. The brightest star belonged to the first magnitude and the faintest to the sixth. This scale of brightness, as perceived by the human eye, worked out at a ratio of 2.5 between magnitudes, that is to say, stars of the first magnitude were 2.5 times brighter than stars of the second magnitude and so on.

This scale was adopted by modern astronomers in 1856. But the ratio between magnitudes was made more accurate at 2.512. A difference of 5 magnitudes thus showed a ratio of 100 to 1 in brightness.

The star *Aldebaran* was taken as representing a brightness of 1.0 magnitude. The magnitudes of other celestial bodies were measured in terms of this unit. The magnitudes of stars, brighter than Aldebaran, were indicated by the minus sign and stars of lesser magnitudes by the plus sign. Thus, the higher the negative number (minus sign) the brighter the star, and the higher the positive number (plus sign) the fainter.

We have to be on our guard against judging the true brightness of stars by their apparent brightness. Thus our Sun appears to be about 40 million times brighter than Aldebaran. But the Sun is only a few minutes away (8 min. 16.6 sec. in terms of the light year) while Aldebaran is 53 light years away and is actually a hundred times brighter than the Sun. Or take two other stars, *Sirius* in *Canis Major* and *Canopus* in *Carina*. To the naked eye, Sirius appears to be twice as bright as Canopus. But Sirius is only 8.7 light years distant, while Canopus is 100 light years away. This means that Canopus shines many times more brightly than Sirius.

The naked eye can see stars down to +6.5 magnitude. A 6" telescope can show stars down to +13 magnitudes. The largest telescope can photograph stars down to +23.5 magnitudes.

Table 12

(Relation between Magnitude and Brightness)

Difference in magnitude		*Ratio of light*
0	—	1:1
0.5	—	1.6:1
1	—	2.5:1
2	—	6.3:1
5	—	100:1
10	—	10,000:1
20	—	100,000,000:1
40	—	10,000,000,000:1

Table 13

The Brightest Stars on the Horizon

Constellation	*Star*	*Distance (light years)*	*Colour*	*Brightness Sun=1*
Centaurus	Alpha Centauri	4.3	Yellow	1.5
	Beta Centauri	300	Blue-White	5000
Canis Major	Sirius	8.7	White	23
Canis Minor	Procyon	11.3	Yellow-White	7.3
Aquila	Altair	16.5	White	11
Piscis Australis	Fomalhaut	23	White	14
Lyra	Vega	27	White	55
Bootes	Arcturus	36	Orange	110
Gemini	Castor	45	White	27
	Pollux	40	Orange	45
Auriga	Capella	47	Orange	170
Taurus	Aldebaran	53	Orange	100
Eridanus	Achernar	65	Blue-White	200
Leo	Regulus	75	Blue-White	120
Carina	Canopus	100	Yellow-White	1500
Virgo	Spica	260	Blue-White	2800
Scorpius	Staula	300	Blue-White	1700
	Antares	400	Red	5000
Orion	Bellatrix	360	Blue-White	2300
	Betelgeuse	500	Red	1700
	Rigel	800	Blue-White	40000
Cygnus	Deneb	1400	White	60000

9. CONSTELLATIONS

Stars forming a group are called constellations. Many of the constellations are only seemingly so. A number of stars appear to form a group because some happen to be almost behind the others in our line of vision.

Many stars and groups of stars, forming apparent constellations have been named after legendary heroes or called after familiar forms and animals. Some names like *Corona Borealis* (the Northern Crown), *Cygnus* (the Swan) and the seven stars in Ursa Major, known as the *Plough*, bear some semblance to the figures of things they are supposed to represent. Many others call for a highly extended imagination in order to connect their shapes with their names.

Star Clusters. There are two types of star groups. The first group called *open* or *galactic clusters* are groups of up to two or three hundred stars which are found in the spirals of the Milky Way. The open clusters visible to the naked eye are the *Pleiades*, the *Hyades* and the *Praesepe*. Of these, the finest spectacle is the Pleiades which glitter like a swarm of fireflies tangled in a silver braid. The Pleiades consist of some 200 stars, of which we can see some 12 or 14 without the aid of mechanical devices.

The second group, called *globular clusters*, contains over one hundred thousand stars and represents the outer stellar population of the Milky Way.

Recognised Constellations. In 1928 the International Astronomical Union recognised 88 constellations. These constellations are mainly used to describe the location of stars and the positions of comets, meteors or other heavenly bodies. Obviously, it is easier to speak of a star in Aquila or Orion than to describe its exact astronomical position. The names of the recognised constellations are given below.

Table 14
Constellations

Latin Name and Abbreviation		*English Version*
Andromeda	And	Chained Maiden
Antlia	Ant	Air Pump
Apus*	Aps	Bird of Paradise
Aquarius	Aqr	Water Bearer
Aquila	Aql	Eagle
Ara*	Ara	Altar
Aries	Ari	Ram
Auriga	Aur	Charioteer
Bootes	Boo	Herdsman
Caelum	Cae	Chisel
Camel Opardalis	Cam	Giraffe
Cancer	Cnc	Crab
Canis Venatici	CVN	Hunting Dog
Canis Major	CMa	Great Dog
Canis Minor	CMi	Small Dog
Capricornus	Cap	Sea Goat
Carina*	Car	Keel
Cassiopeia	Cas	Lady in Chair
Centaurus*	Cen	Centaur
Cepheus	Cep	King
Cetus	Cet	Whale
Chameleon	Cha	Chameleon
Ciricnus*	Cir	Compasses
Columba	Col	Dove
Coma Berenices	Com	Berenice's Hair
Corona Australis	CrA	Southern Crown
Corona Borealis	CrB	Northern Crown
Corvus	CrV	Crow
Crater	Crt	Cup
Cruz*	Cru	(Southern) Cross
Cygnus	Cyg	Swan
Delphinus	Del	Dolphin
Dorado*	Dor	Swordfish
Draco	Dra	Dragon
Equuleus	Equ	Little Horse
Eridanus	Eri	River Eridanus
Fornax	For	Furnace
Gemini	Gem	Twins
Grus*	Gru	Crane
Hercules	Her	Hercules
Horologium*	Hor	Cloak
Hydra	Hya	Sea Serpent
Hydrus*	Hyi	Water Snake
Indus*	Ind	Indian
Lacerta	Lac	Lizard
Leo	Leo	Lion
Leo Minor	LMi	Small Lion
Lepus	Lep	Hare
Libra	Lib	Scales
Lupus*	Lup	Wolf
Lynx	Lyn	Lynx
Lyra	Lyr	Lyre
Mensa*	Men	Table (Mountain)
Microscopium	Mic	Microscope
Monoceros	Mon	Unicorn
Musca*	Mus	Fly
Norma*	Nor	Square
Octans*	Oct	Octant
Ophiuchus	Oph	Serpent Bearer
Orion	Ori	Orion (Hunter)
Pavo*	Pav	Peacock
Pegasus	Peg	Pegasus
Perseus	Per	Perseus(Champion)
Phoenix*	Phe	Phoenix
Pictor*	Pic	Painter's Easel
Pisces*	Psc	Fishes
Piscis Austrinus	PsA	Southern Fish
Puppis	Pup	Poop (Stern)
Pyxis	Pyx	Compass
Reticulum*	Ret	Net
Sagitta	Sge	Arrow
Sagittarius	Sgr	Archer
Scorpius	Sco	Scorpion
Sculptor	Scl	Sculptor
Scutum	Sct	Shield
Serpens	Ser	Serpent
Sextans	Sex	Sextant
Taurus	Tau	Bull
Telescopium*	Tel	Telescope
Triangulum	Tri	Triangle
Triangulum Australe*	TrA	Southern Triangle
Tucana*	Tuc	Toucan
Ursa Major	UMa	Great Bear
Ursa Minor	UMi	Small Bear
Vela*	Vel	Sails
Virgo	Vir	Virgin
Volans*	Vol	Flying Fish
Vulpecula	Vul	Fox

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* Those marked with an asterisk are not visible from mid northern latitudes.

10. LIFE OF A STAR

Star Birth. Stars are formed by gravitational contraction from vast clouds of galactic gas and dust. Star-forming clouds are thousands of times denser than the normal interstellar gas. They have a density going up to 1000 hydrogen atoms per cubic centimetre. Many such pre-star clouds are visible in our own galaxy, the nebula in Orion, being one.[*]

The life of a star is spread over billions of years. Stars start life as condensing masses of gas. As condensation progresses, individual atoms are drawn towards the centre by force of gravity. They pick up speed as they fall to the centre. According to the speed of the fall, they increase their energy which tends to heat the hydrogen atoms. When this process goes on for some millions of years, the heat goes up to about 10 million degrees centigrade. At this temperature the hydrogen in a star ignites and begins to burn in a series of nuclear reactions. This marks the birth of a star.

The nuclear reaction in a star is called 'nuclear fusion' which goes on in all the stars, all the time. This means that lighter atoms are split up and reconstituted into heavier atoms. Thus at about 10 million degrees centigrade, hydrogen atoms are broken up to form helium. Four protons of hydrogen combine to make one nucleus of helium ($4H \rightarrow He$). When all the hydrogen in the star is converted to helium, the star begins to shrink and becomes smaller in size. As it gets smaller, temperature rises. When the temperature reaches a 100 million degrees, more complicated nuclear reactions occur. Three nuclei of helium combine to make one of carbon ($3\ He \rightarrow C$). One nucleus of carbon combines with one of helium to make oxygen ($C + He \rightarrow O$). As the star shrinks further and the temperature rises to say 2000 to 4000 million degrees, highly complicated nuclear fusions occur. Carbon and oxygen combine to form iron, magnesium, silicon and other heavy elements.

Dying Star. When the hydrogen in a star is converted into heavier atoms like helium, the density of the star increases manifold and the star is well nigh dead. The core of a dying star contains the densest matter in the universe.[‡] The ultimate destiny of a star, according to present theories, is that it will turn into one of three things—according to its mass—*White Dwarfs*, *Neutron stars or Pulsars* and *Black Holes*.

If the star is about the mass of the Sun or less than that, it will turn into a white dwarf. If the star is bigger than the Sun but not more than twice as big, it will turn into a neutron star or pulsar. If the star is many times bigger than the Sun, it will turn into what is called a *Black Hole*.

White Dwarfs. Stars lighter than 1.2 solar mass tend to die as white dwarfs. The white dwarfs are no bigger than the Earth (around 6000 km radius) but their central density is so great that it can reach 10^8 grams per cubic centimetre. This means that a teaspoon of its material will weigh as much as a ton. In white dwarfs, the enormous contracting pull of gravity is balanced by the pressure created by the rapidly moving electrons. White dwarfs are distinguished by their high luminosity and high surface temperature. A white dwarf will continue for millions of years generating heat and light. But it will steadily cool down and ultimately turn into a *black dwarf*, emitting neither heat nor light. It will thus be reduced to cinder and consigned to the ash-heap of the Universe.

Neutron Stars or Pulsars. Stars whose mass is between 1.2 times and something less than 2 times the mass of the Sun, turn into neutron stars or Pulsars. Neutron stars are so called because they are made up, almost entirely, of atomic particles called *neutrons*. In a neutron star, matter is compressed until it approaches the density of matter within an atomic nucleus about 10^{14} grams per cubic centimetre. A teaspoon of neutron star matter would weigh a billion tons. This is a density, a billion times greater than the density of white dwarfs.

The collapse of a big star into a neutron star happens in a matter of seconds.

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[*] See Box 'Orion Molecular Complex'.

[‡] *Note:* Constituents of matter are a function of density. At a density beyond 10^8 grams cm^3 (10^6 is million and 10^{12} is million million) electrons become so energetic, that they combine with protons in nuclei to form neutrons. Beyond 3×10^{11} grams cm^3 the nuclei begin to liberate neutrons. At around 3×10^{14} grams cm^3, nuclear break up into separate protons and neutrons and so on.

The shock wave of collapse, coming from the interior, blasts the outer layers of gases in the star into space. This would look like the explosion of a nova. After the explosion the star shrinks.

In the shrunken neutron star left by the explosion, gravitational energy would raise the temperature to many millions of degrees. Yet, the outer crust of the star, about a kilometre thick, remains unaffected and does not melt. It is a fantastically solid and rigid crystalline material, 10^{15} times stiffer than steel. Inside, the neutrons form a *Super fluid*** with almost no viscosity.

Calculations show that an object as dense as a neutron star must also have a prodigious gravitational power—a hundred billion times that of the earth. So strong is the gravitational pull that a mountain on the surface of a neutron star would not rise higher than an inch. All the energy that a man can put out in a lifetime would not be enough to climb that one-inch mountain. It is estimated that as many as a 100 million of the 100 billion stars in our galaxy, must have burnt themselves out and collapsed into neutron stars.

It is now agreed among astronomers that pulsars are fast rotating neutron stars. Pulsars were first noticed by British astronomers in Cambridge in 1961. They are distinguished by the fact that they send out radio waves in regular frequency, like the ticking of a clock. By 1969 some three dozen pulsars were located. The discovery of the Pulsar NP 0532 in the Crab Nebula in 1968 represented a major breakthrough. This pulsar sent out radio waves at the remarkably short radio period of 0.033 second. It is presumed that this pulsar is a survival of the supernova explosion of A. D. 1054 which formed the Crab Nebula.

The Crab Nebula pulsar (NP 0532) shows signs of slowing down, at the infinitesmal rate of about one part in 2500 in a year. This means that the pulsar is slowly decaying as it uses up its energy. Meanwhile, it pours out radiation at a stupendous rate—about 10,000 times the radiation of the Sun.

NP 0532 is not the only pulsar, known to be associated with an old supernova. PSR 0833-45, discovered by Australian astronomers in 1968, pulsates every 0.089 seconds. This has been located in the Vela Nebula which is considered to be the debris from an unrecorded supernova explosion, several thousand years ago. The rate of pulsation of the Vela pulsar is gradually lengthening, a property shared by other observed pulsars. It is also noticed that the pulsation of the Vela Pulsar, tends to become irregular. Such behaviour indicates that the pulsars could not safely be used as precise time-keepers.

Black Holes. Black Holes is a misleading term because what they represent are not holes at all. On the contrary, they are stars, which have contracted so much that they have developed super density, 10^{16} grams per cubic centimetre. This represents a density greater than the ultra-density of white dwarfs (10^3 grams cm^3) and neutron stars (10^{14} grams cm^3). The black hole is the destiny of all stars, whose mass is considerably greater than the mass of the Sun. They are so compact and their gravitational pull so strong, that even light or radiations produced by them cannot escape them. So they cannot be seen by optical telescopes.

Black Holes were predicted by Einstein's general theory of relativity. The theory is this. If a given mass is condensed into progressively smaller radii, its gravitational influence becomes so strong that below a critical radius the radiation emitted by the object can no longer escape from it. This critical value of the radius is called the *Schwarzchild radius* after the German astronomer, Karl Schwarzchild who first obtained the solution of Einstein's field equations for a spherical mass in 1916. The Schwarzchild radius for the Sun would be about 2 miles. An object, with the Schwarzchild radius is referred to by astronomers as a 'Black Hole' since it cannot be seen by a distant observer.

A Black Hole is an awesome phenomenon. It is the smallest and the densest object in the Universe. Its gravitational power is incredible. It can swallow up everything near it and nothing that gets into it can ever escape from it. It can neither crack nor split nor decrease in size. It can only grow and nothing in the Universe can stop it from growing. This is a foreboding prospect.

The Black Hole is a collapsed star or as some would call it a *Collapsar*. The collapse of the star or its transformation into a Black Hole is quick and invisible. The star merely winks out and is never seen again. But although invisible, it exerts a terrific influence over everything around it.

We do not know what is inside a Black Hole or what goes on within its

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** See *Cryogenics* infra.

bowels. It is, however, believed that a Black Hole has a perfectly smooth surface without any ups or downs. A Black Hole cannot be identified by any direct means. Indirect evidence is, however, available. It is its enormous gravitational power that gives it away.

Cygnus X-I. One such Black Hole, recently identified, is a powerful but invisible X-ray object, called Cygnus X-1. It has been spotted by satellites which carried X-ray telescopes. Cygnus X-1 is paired with a super-star, (HDE 226868) which is visible. The unseen Cygnus X-1 is drawing out a stream of gases from its visible companion. The stream of gas spirals around the Black Hole. One end of the spiral ultimately disappears into the Black Hole. What is happening is that Cygnus X-1 is bleeding its companion, a big blue star, to death. As the gases spiral in towards the Black Hole, they collide, compress, heat up high temperatures and send out intense X-rays. It is these X-rays that have indicated the presence of a Black Hole in the vicinity.

This Black Hole is estimated to be about the size of three Suns. On the face of it, this appears to be a small size for a Black Hole which is capable of swallowing up whole galaxies. But this size is the Schwarzchild size. When our Sun is reduced to the Schwarzchild size, it will have a radius of about 2 miles only. Cygnus X-1 has a Schwarzchild radius 3 times the present radius of the Sun. This is big enough to absorb galaxies.

Some scientists suggest that the centre of our galaxy is occupied by a Black Hole.* Dr. Kip Throne of the California Institute of Technology, a leading authority on collapsed stars, thinks that ultimately this Black Hole, if it exists, will eat up the whole matter in our galaxy. He says, "We would like to sweep this fact under the carpet, but occasionaly, we drag it out, look it in the face and shudder."‡

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* See the *Milky Way*, Supra.

‡ Also see the *Quasars*, infra.

11. QUASARS

Quasars and QSO's. Quasars or Quasistellar Radio sources are, as the name implies, part-star and part-radio objects. These were originally considered stars, and later classified as radio-galaxies, that is galaxies that emit radiation at radio frequencies. In 1960 it was found that these objects were not mere radio galaxies, but were unique objects which combined the characteristics of stars and radio galaxies. They were therefore named *Quasistellar Radio sources* or *Quasars*.

In 1965, it was noted that many of the so-called quasars were quiescent, that is, radio-quiet. In fact it turned out that the majority of quasars were radio-quiet. Such quasars were named *Quasistellar Objects* or Q. S. O.

Discovery of Quasars. The first quasar was discovered, or rather identified, by Thomas Matthews and Alan Sandage (US) in 1960. It was a star-like object numbered 3C48 in the Third Cambridge Catalogue and was supposed to be a radio galaxy. In 1963, another quasar, numbered 3C273 was identified. Like 3C48, this was also originally classified as a radio galaxy. More quasars have been identified since. Though many objects are suspected to be quasars, only about 350 have been confirmed as such till recently. These are compact blue objects that emitted radiation strongly in the ultra-violet as well as the radio portion of the spectrum. They exhibited many peculiarities like fluctuating brightness and large red shifts.

Peculiarities of Quasars. Quasars are small objects compared to galaxies but all of them emit radiation far in excess of their size or brightness. Some are believed to emit energy which is greater than the combined energy emitted by a hundred galaxies like the Milky Way. Another peculiarity is that they fluctuate in brightness at intervals. Since they emit prodigious energy their life-times are short. Many of them die out in less than a billion years while stars live through billions of years.

In the words of Prof. John Wheeler of Princeton "Quasars are beacons that light up the far away and the long ago." All of them are removed from us by distances of billions of light years. Quasar OQ172 which was discovered in 1973 appears to be the farthest from us—at 10 billion light years. This means that the light from this quasar must have started on its way to us 10 billion years ago. So what we see now is how the quasar looked 10 billion years ago. Quasars are also the fastest receders known. Their speed of recession ranges from 15 to 90% of the velocity of light. The red shift of OQ 172 indicates that it is moving off at 90% of the velocity of light.

Energy Potential of Quasars. Nobody knows how the quasars have come to possess such massive energy potential. Among the various explanations offered, two may be mentioned here. Thomas Gold of Cornell University thinks that quasars are a product of the wholesale cataclysm caused by a Black Hole. A Black Hole is characterised by a gravity so colossal that it emits nothing. Nothing that falls into it can get out—not a sound, not even a heat or light wave. When a massive star has collapsed into a Black Hole, it reaches out to pull all the nearby stars into itself, thus making the Black Hole bigger and stronger. When the Black Hole grows powerful enough to menace a whole galaxy the threatened stars put out all their energy to keep from falling in. The crackling heat of a whole galaxy fighting to avoid going down a Black Hole might very well be the mystery behind the incredible energy output of the quasars.

Another hypothesis that incidentally explains the great energy released by quasars is that in the universe, matter is balanced or countered by anti-matter. Physicists have discovered that the *protons* and *electrons* of a hydrogen atom have anti-particles called *anti-proton* and *positron.* These anti-particles have the same properties as protons and electrons but opposite charges. It is argued that if a piece of matter and anti-matter are brought together, the protons will annihilate the anti-protons and the electrons will destroy the positrons. The resultant release of energy is calculated to be many thousand times more than that of a hydrogen bomb of similar mass.

It is quite possible that matter and anti-matter mixing in certain regions of the universe will annihilate each other and in the process release enormous quantities of energy. This can very well explain the tremendous energy potential of the quasars.

Quasar population. The quasar population of the universe is estimated to have been about 14 million, in the first instance. As the life-time of a quasar is short, many of these quasars must have degenerated into less luminous, less active objects, perhaps into ordinary galaxies. We know of their existence in the past, because the signals they emitted billions of years ago are only now reaching our telescopes.

To-day, the total population of quasars (including the radio-quiet QSOs) may be estimated at about 1.5 million. Out of these, about 35,000 may be reckoned as radio-emitting quasars.

12. SOLAR SYSTEM

The solar system is centred in the sun. The sun is the head of a family of 9 planets—*Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune* and *Pluto*—41 satellites accompanying the planets, hundreds of asteroids and thousands of comets. The solar system is tucked away in a corner of the Milky Way at a distance of about 30,000 to 33,000 light years from the centre of the galaxy.

The solar system originated in a primitive solar nebula—a rotating disc of gas and dust. It is from this rotating disc that the planets and the rest of the solar system evolved.

Planets. The term *planets* is derived from the Greek word *planetes*, meaning wanderers. Unlike the stars, which are visible in their fixed positions in the sky always, the planets shift their positions and sometimes even disappear from view. Therefore they came to be called planets or wanderers. The first known planets were named after the Roman gods—*Mercury, Venus, Mars, Jupiter* and *Saturn*. The other planets, when they were discovered later were also named according to the old pattern—*Uranus, Neptune* and *Pluto*.

The planets are divided into the inner planets and the outer planets. The inner planets are Mercury, Venus, Earth and Mars. The Earth is the largest of the inner planets and the densest of all planets. All the inner planets are dense rocky bodies and are collectively called terrestrial planets, because they resemble the Earth. The outer planets, Jupiter, Saturn, Uranus and Neptune are very big, with large satellite families. They are composed mostly of such elements as hydrogen and helium. These planets are called Jovian, after Jove, the Greek name for Jupiter, because they resemble Jupiter in many things. All of them rotate furiously, wear dense atmospheres and consist of far lighter elements than the earth-like or terrestrial inner planets.

The outermost planet Pluto is in a class by itself. It is supposed to be a dense planet like the inner planets, although it is the farthest of the outer planets.

Rotating on their own axes, the planets revolve round the sun in long elliptical orbits.

Table 15

Solar System—Planets—Comparative Data

	Mercury	*Venus*	*Earth*	*Mars*	*Jupiter*	*Saturn*	*Uranus*	*Neptune*	*Pluto*
Mean Dist. from the Sun (million km)	57.9	108.2	149.6	227.9	778.3	1427	2869.6	4496.6	5900
Mean Dist. from the Sun (Astronomical Units) (Earth= 1)	0.387	0.723	1	1.254	5.203	9.539	19.18	30.06	39.44
Period of Revolution	88 days.	224.7 days.	365.26 days.	687 days.	11.86 years.	29.46 years.	84.01 years.	164.8 years.	247.7 years.
Period of Rotation	59 days	—243 days*	23h. 56m. 4s.	24h. 37m. 23s.	9h. 50m. 30s.	10h. 40m.	—11h.*	16h.	6 days 9h.
Inclination of Axis (degrees)	28	3	0	1.9	1.3	2.5	8	1.8	17.2
Equatorial Diameter (km)	4880	12104	12756	6787	142800	120000	51800	49500	6000(?)
Mass (Earth= 1)	.055	.815	1	.108	317.9	95.2	14.6	17.2	.1(?)
Volume (Earth= 1)	.06	.88	1	.15	1316	755	67	57	.1(?)
Density (Water= 1)	5.4	5.2	5.5	3.9	1.3	.7	1.2	1.7	(?)
Surface Gravity (Earth= 1)	.37	.88	1	.38	2.64	1.15	1.17	1.18	(?)
Satellites known	0	0	1	2	14	10	5	2	0

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* Retrograde

13. OTHER PLANETARY SYSTEMS

A question that has intrigued astronomers and laymen alike, is whether there are other planetary systems, like the solar system, in the universe. Many astronomers think that now they are well on their way to answer this question in the affirmative. The sun is an ordinary star, and has been formed in much the same way as other stars. It therefore stands to reason, that if the sun has planets, many other stars must have them too.

The difficulty has been to gather optical or radio evidence to substantiate this theoretical assumption. For, the nearest stars are many light years distant. Their planets, if they have any, will be far too small for our most powerful telescopes. And planets, as a rule, are not radio sources. However, indirect evidence is available to show that at least 3 stars out of the 12 nearest to the sun have some sort of a planetary system.

The following is a list of stars, near to the sun, which are supposed to possess planetary systems like our own.

Star		*Distance (million Light years)*	*Planet (Mass–Jupiter=1)*
1	Barnard's Star	6.1	15
2	Lalande 21,185	7.9	10
3	61 Cygni	10.7	8
4	BD+5 degrees 1668	12.4	20 (?)
5	CI 2354	15.1	20 (?)
6	BD+20 degrees 2465	15.5	20 (?)
7	BD+43 degrees 4305	15.7	20 (?)
8	CIN 2347	25.5	20 (?)

Barnard's Star. Barnard's star, some 6 million light years from the earth, is one of the first stars noted by the astronomers, as being likely to have a planetary system like our own. In 1974 two Canadian scientists, Oliver Jensen ann Tadenz Ulrich, claimed in the *Astronomical Journal* that Barnard's Star has five planets orbiting it. They have masses ranging from 0.7 to 1.6 times the mass of Jupiter, the largest planet in the solar system. Orbiting distances from Barnard's star are calculated to be between 0.95 and 4.7 times the Astronomical Unit.

None of the planets, however, is likely to have terrestrial conditions because Barnard's star is a feeble dwarf only ⅙ the mass of the sun and it shines but faintly on its planets.

It looks likely that the Milky Way, with its 100,000 million stars, will have several million planets too. And this goes for other galaxies as well.

14. THE SUN

Cosmic Year. The sun is one of the stars in the Milky Way. Modern estimates place the Sun at a distance of about 32,000 light years from the centre of the galaxy. The Sun and the neighbouring stars generally move in almost circular orbits around the galactic centre at an average speed of about 250 km per second. The Sun at this rate takes 250 million years to complete one revolution round the centre. This period (250 million years) is now called a *cosmic year*.

A Red Giant. Like all other stars, the sun is composed mainly of hydrogen. Its energy is generated by nuclear collisions in its interior. It is calculated that the sun consumes about a trillion pounds of hydrogen every second. At this rate, it is expected to burn out its stock of hydrogen in about 5 billion years and turn into a red giant. The prospect is frightening.

When the sun turns into a red giant, it would have swelled a hundred times in diameter and increased a thousand times in brightness—bright red. It will then occupy about 25 per cent of the horizon. The nearest planets, Mercury and Venus, would melt. The oceans of the earth would evaporate and disappear. The earth would remain a barren rock, heated to the melting point of lead. All life on earth would cease. The Sun will survive as a red giant, for about a hundred million years more, slowly dissipating its enlarged outer shell leaving a tiny core. This core will be a faint, white dwarf-sun no larger than the present planet Mars. Around this tiny star, the burnt-out earth will continue to revolve.

Structure of the Sun. The glowing surface of the sun, which we see, is called *Photosphere*. Above the photosphere, is the *Chromosphere*, so called because of its reddish colour. Beyond this layer is the magnificent *Corona* of the sun which is visible during eclipses.

At the core of the sun where thermonuclear reactions take place the temperature level is around 15 million degrees K. The density at the core is estimated at a hundred times that of water. Outside the core is the convection zone. Here, like the boiling water in a kettle, turbulent motions of gases transport the energy that is generated in the core towards the photosphere.

The chromosphere which surrounds the photosphere extends outward for some 2500 km above the photosphere. Temperature levels shoot up in the chromosphere by several thousand degrees. Above the chromosphere is the corona extending for a million km into space, with the temperature going up to more than a million degrees. The corona is white and extends to one solar diameter from the centre of the disc, that is about 1.4 million km. The temperature in the corona may range from 1 to 3 million degrees K.

The visible white light of the corona is made up of a continuum of colours, such as violet, indigo, blue, green, yellow, orange and red. Super-imposed on this continuum are hundreds of dark lines called the *Fraunhofer lines*. Each line indicates some element present in the solar atmosphere. The intensity and width of the lines reveal the temperature and density of the element.

Prominences & Flares. The sun is constantly emitting streams of its substance (mainly hydrogen) as protons (nuclei of hydrogen atoms) in all directions. Sometimes these emissions are massive. They are then seen as *prominences* which send huge bouts of incandescent material upward from the sun's surface. Sometimes these eruptions roll out of the atmosphere of the sun for many miles, when they are seen as solar *flares*. The solar flares are spectacular—hot ionised gas rolling out as enormous clouds, 20 to 40 times the size of the earth at speeds of around 100 km per second through the outer layer of the sun's atmosphere, the Corona. Some of the most spectacular solar flares seen in recent years occurred on Feb. 28, 1942, Nov. 19, 1949 and Dec. 13, 1971.

Solar Wind. A less spectacular but persistent stream of protons is blowing out of the corona and sweeping over the whole solar system. In 1958, the American physicist, Eugene Norman Parker, called this outward stream of protons the *solar wind*. Recent researches through satellites have shown that the solar wind is made up of a plasma*, that is, ionised gas, mostly hydrogen and helium, containing nearly an equal number of protons and electrons. It flows outward from the Sun at supersonic speeds, around 400 km a second. Apparently, this wind sweeps through the whole solar system to a distance of 40 AUs from the sun which coincides with the very limits of the planetary orbits.

Owing to the sun's rotation, the solar wind travels in spirals and carries with it magnetic fields. The earth's magnetic field—the magnetosphere—acts as a shield against the ever-blowing solar wind and deflects it away from the earth. Nevertheless, particles of solar wind sometimes pierce the magnetic shield and enter the upper atmosphere, where, like the solar flares, they cause auroral displays.

The solar wind distorts the shape of the magnetosphere. The magnetosphere extends to a distance of 64,000 km above the earth—10 times the radius of the earth. On that part of the earth exposed to the sun (the sunlit side), the solar wind sweeps along the magnetopause past the earth. On the other side of the earth (the night side), the solar wind converges again and compresses the magnetic field into a plume or tail, more or less like what it does to comets. The tail thus formed extends to over six million km on the night side of the earth. The particles of the solar wind and also those from the deep space are trapped in the tail and travel back and forth endlessly.

Sunspots. These are dark patches noticed on the surface of the sun. They appear dark because they are cooler (around 1500°C) than the surface of the sun which has a temperature of about 6000°C. The largest spot ever measured (April, 1974) covered 7000 million sq. miles or approximately 0.7 per cent of the sun's visible surface. The life periods of these spots also vary. They may last from a few hours to many weeks.

They show strong magnetic fields and reach a maximum every 11 years. During the maximum of a sun-spot period, the sun shows marked activity in shorter "wave lengths" like X-rays and ultraviolet radiations. Frequent solar eruptions and solar flares occur. These produce great reactions on the earth and its atmosphere such as ionospheric disturbances, magnetic storms, interruptions of radio communications, unusual auroral displays and a lowering of the average cosmic ray intensity.

Table 16

Solar Statistics

Distance from the Earth	149.8 million km.
Absolute Visual Magnitude	4.75
Diameter	1392000 km
Core Temperature	15000000 K
Photosphere Temp.	5770 K
Rotation as seen from the Earth	25.38 days (at the Equator) 33 days (near the poles)
Chemical Composition	Hydrogen 71% Helium 26.5% Other Elements 2.5%.
Age	About 5 billion years.
Expected lifetime of a normal star	About 10 billion years.

Source: Science Today, Feb. 1980.

Polar Auroras. There are two auroras, the *Aurora Borealis* or Northern Lights and the *Aurora Australis* or Southern Lights. These are lights that sweep across the sky in waves or streamers or folds. They are very often multi-coloured and provide one of the finest spectacles in nature. They occur in the Arctic and the Antarctic regions. But the Northern Lights can be seen as far south as New Orleans in America and the Southern Lights as far north as Australia.

The auroras are chiefly caused by sunspots, which are magnetic storms on the surface of the sun. These storms discharge electrified particles into space. The Earth's magnetic poles attract these particles. Consequently, the north and south poles are the radiating centres of these electromagnetic displays. The electrified particles from the sun cause gases in the upper atmosphere to vibrate and glow in colours peculiar to them, just as a neon sign glows when electric charges pass through it. The causal relation between sunspots and auroras has been doubted, because the interval between the two was always erratic and never uniform. This has now been explained by the discovery of the magnetosphere.

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* Plasma is a fourth state matter (in addition to solids, liquids and gases) where the gases are ionised. An *ion* is an atom or group of atoms which has gained or lost one or more electrons and thus carries a negative or positive charge. *Proton*, the nucleus of the hydrogen atom without its electron, is a *hydrogen ion*. *Alpha particle*, the nucleus of the helium atom without its electrons, is *helium ion*.

Magnetosphere. The magnetosphere is the earth's magnetic shield. It was at first called the *Van Allen Belts* after the American physicist, James Van Allen who discovered them in 1959. Van Allen in analysing the data from the earlier Explorer and Pioneer rockets found two belts of high intensity radiation in the upper atmosphere. Pioneer 12 later showed that these belts were a part of a larger band of radiation called the magnetosphere. It extended far out to about 40,000 miles from the earth's surface. Here the protons and electrons that shot out from the sun are caught and held by the magnetism of the earth. The upper belt with its centre, some 1500 miles from the earth, does not touch the atmosphere. The lower layer, several hundred miles high is much larger and touches the atmosphere in the vicinity of the poles. Electrons that burst out with sunspots are trapped by the upper layer. Only the "overflows" pass into the lower belt and illumine the atmosphere. This is supposed to explain the irregular time lag between sunspots and auroras.

15. INNER PLANETS*

Mercury. Mercury is the planet closest to the Sun and the smallest. It was believed that the period of Mercury's rotation on its own axis corresponded with its period of revolution, like that of the Moon. Recent radar readings, however, have shown that Mercury rotates on its own axis in 58.65 days, while it takes 88 days to complete one revolution round the Sun. This means that Mercury spins three times (3×58.65 days) for every two revolutions (2×88 days) round the Sun. The result is that when Mercury is in a most favourable viewing position, we see nearly the same face with the same markings. This is how the mistaken notion arose that its period of rotation was the same as its period of revolution.

According to Gerard Kupier, Mercury was probably twice as massive originally but the Sun evaporated away half its substances. The lighter, more volatile elements escaped, leaving a heavy planet, that is probably about 30 per cent silicates or rock and 70 per cent metals. It is 5¼ times as dense as water. Even today Mercury bathes constantly in the ferocious heat of the Sun. When it is closest to the Sun, temperatures reach 650°F on the equator though they probably drop during the long night to minus 300°F.

Astronomers have never seen Mercury really well, even though it is reasonably close to the Earth. The planet stays so close to the Sun in its tiny orbit, that to the naked eye, it is almost always lost in the Sun's glare. From the Earth, it can sometimes be seen for a short time as an *evening star* just after sunset or as a *morning star* just before dawn. But the Earth's thick, haze-and-dust-filled atmosphere on the horizon often blots it out.

It is doubtful if Mercury has an atmosphere. With low gravity (one-third of the Earth's) and high temperatures, atoms and molecules of almost all gases must have escaped into the interplanetary space leaving Mercury devoid of atmospheric gases.

Venus. Venus, the planet closest to the Earth, is also the brightest object in the sky, barring, of course, the Sun and the Moon. Named after the Roman goddess of beauty, Venus is popularly known as a star—as the *Evening Star* and the *Morning Star*. It is slightly smaller than the Earth, being some 300 miles less in diameter. Venus, unlike most other planets, rotates backward. Because of the combination of the slow backward motion and the 225 days it takes the planet to make one orbit round the Sun, Venus sees the Sun rising in the west every 117 days.

Many of the popular notions regarding Venus have been radically altered by the space probes of Venera 4 (Oct. 1967), Venera 5 and 6 (May 1969), Mariner 2

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* For data regarding planets, see S. 12 *supra*.

(Dec. 1962) and Mariner 5 (Oct. 1967).† These probes have proved that Venus is a very hot planet—possibly the hottest of planets. Its temperature at the equator may go as high as 1000°F. At such a temperature, lead, tin and zinc will melt and a number of compounds will vaporise. But at the top layers of Venusian clouds temperatures drop to minus 35°F. Here, we have a most interesting phenomenon—a red hot planet wrapped in clouds of ice, with freezing temperatures above and boiling temperatures below.

A curious feature of Venus discovered by the Russian Venera series 7 and 8 is that both the night and day temperatures are nearly the same. This means that heat is being transported from the day side to the night side. Strong winds in the higher atmosphere seem to be the carriers of heat.

While the highest clouds on Earth seldom go above 10 miles, Venus has a thick layer of clouds, about 35 miles high. They block much of the sunlight. The result, according to some scientists, may be a murky twilight on the surface of Venus, more or less like living at the bottom of a dust storm or dense smog. The thick atmosphere does more than block the sunlight. It traps the Sun's energy and builds up a furnace-like heat. This is the well-known 'green house effect'. Solar energy filtering through the clouds is absorbed by the surface and is re-radiated as longer wave length infrared rays. But the cloudy atmosphere of Venus acts like the glass roof of a green house; it blocks the infrared re-radiation from escaping into space. This is supposed to be one of the reasons why Venus has turned out to be a very hot planet.

The surface of Venus appears to be pock-marked with craters, like that of the Moon or Mars. This was brought out in an analysis made by the Jet Propulsion Laboratory (US). An area, some 900 miles wide near the Equator of Venus, is marked with a dozen or more craters. These are very large craters, with diameters ranging from 21 to 100 miles. There might be smaller craters, but they are not visible. The area is basically flat, no more than 3300 ft. in altitude. All the craters are shallow, compared to their area. The 100-mile crater is only a quarter of a mile deep.

The atmosphere of Venus is also unique, consisting as it does almost entirely of carbon dioxide (90–95 per cent). It has a pressure of a hundred terrestrial atmosphere (100 times the pressure of the Earth's atmosphere). This is equal to the pressure of water more than half a mile under the sea.

Venus has no satellites like Jupiter, no rings like Saturn and no ice caps like Mars. It has a very weak magnetic field, 3/10,000 of the Earth's magnetic field and has no radiation belt like Van Allen Belt.

Earth

(See the Earth)

Mars. Mars, named after the Roman god of war, is the fourth planet from the Sun. When Mars is favourably situated it is brighter than most of the stars and is definitely red, which has earned for it the surname Red Planet. Mars has polar caps similar to those of the Earth and because the Martian axis is tilted at almost the same angle as the Earth's, its polar regions are exposed to sunlight in alternation, giving each hemisphere summer and winter.

The relative orbits of Mars and Earth bring them very close—a little more than 35 million miles—on two occasions about 2 years apart and then remove them far apart for another 15 years. In September 1956, Mars paid the second of the current series of close visits to the Earth and the third in 1971.

The pictures that Mariner 9 has sent down show that Mars is internally alive and more like the earth than the moon, with volcanoes, greater than any on the earth, canyons and dusty basins, jumbled uplifts and fractures.

Mightiest of the Martian mountains is *Nix Olympica* (the snow of Olympus), a volcanic mountain that embraces a vast caldera or crater 40 miles across. It is the highest point on Mars, standing some 15 miles above the plain, nearly three times as high as Mount Everest.

Mars is marred by a huge rift which cleaves the planet's equatorial zone for 2300 miles. It is 20,000 feet deep and 75-150 miles wide. This huge rift proves that planet's interior is geologically alive.

Mars is a dusty planet, with the dust often in motion, driven helterskelter by dust storms, which sometimes envelop the major portion of the planet in a dusty haze.

Mars must at one time have had meandering rivers like those on Earth, if the dry 'river beds' are any indication.

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† Later probes by US and USSR have materially added to our knowledge of the planet. The latest probes were in Dec. 1978—Pv (Pioneer Venus)1 & 2, US, and Venera 11 & 12, USSR.

†Schiaparelli does not appear to have been just fanciful when he spoke of canals, for the sinuous channels seen on Mars are in all likelihood, "the beds of ancient rivers through which large amounts of water, once flowed".* But today liquid water does not exist on the surface of Mars.

The Viking mission to Mars in 1976 was intended to find out if there were any signs of life on Mars. Viking I landed on Mars on July 20, 1976 and Viking II on Sept. 3, 1976. The experiments conducted by them have shown that there is no sort of life on Mars.

Mars has two small satellites, which have been named *Phobos* (Fear) and *Deimos* (Terror), after the legendary attendants of the war god, Mars. The Mariner 9 pictures of Phobos show it to be 20.8 km wide by 24.8 km long. Of the 34 moons in the solar system, Phobos is the only one moving around its parent planet faster than the planet itself. It completes three trips—11 hours each—every Martian day (24 hours 40 minutes). Deimos, with a diameter of only 8 km requires only a few hours more to revolve around Mars than what Mars takes to rotate on its own axis. As opposed to Phobos, Deimos is a slow moon. Phobos would pass between Mars and the Sun about 1400 times each year, while Deimos passes only 130 times. As seen from Mars, Phobos would appear to rise in the west and set in the east while Deimos does just the opposite.

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† Schiaparelli, an Italian astronomer, announced in 1877 that he had seen canals on the surface of Mars and suggested that Mars might be inhabited by intelligent beings.

* Bradford A, Simth, Director of Planetary Research, New Mexico University.

16. OUTER PLANETS

Jupiter. Jupiter is the giant among the planets. Its mass is 71 per cent of the total mass of the planets. It has one and a half times the volume of all the other planets combined. But its mean density is only one-fourth of the earth's—a low value characteristic of all the Jovian planets.

Jupiter appears to have stopped halfway to becoming a star. It was too massive to solidify as a planet but not massive enough to develop 'nuclear fusion' and become a star. It has thus come to possess both stellar and planetary characteristics. Jupiter's star-like features are two. It gives off more energy than it receives from the sun—two or three times as much. All planets draw from the sun whatever energy they possess. Jupiter emits random bursts of intense radio energy at long wave lengths. It is the most powerful radio object in the solar system, next to the sun. No other planet is known to possess radio energy of its own. In all other respects Jupiter resembles the other planets.

Much of Jupiter's mass is made up of atmosphere which is estimated to be some 25,000 miles deep. The atmosphere consists largely of hydrogen and helium which explain the low density of the planet—1.34, roughly one-fourth of the earth's density. Methane and ammonia which are formed when hydrogen joins with carbon and nitrogen respectively are also present in the atmosphere. It is thought that Jupiter has the primordial atmosphere of the earth—hydrogen, methane, ammonia and water—from which life originated on earth. It is quite possible that a similar process of life will have been started on Jupiter.

The atmosphere of Jupiter is marked by a series of stripes which go round the planet. Astronomers have counted 5 bright stripes and 4 dark gray stripes. The bright stripes appear to be rising columns of air while the dark stripes represent descending columns. The atmosphere changes from gas to liquid at a depth of 1000 km. This is Jupiter's surface, made up entirely of liquid hydrogen, without any detectable solid area.

Jupiter is hot inside. At the core, temperature may go up to 25,000°C which is more than four times the surface temperature of the sun (6000°C).

What is at the core of Jupiter is not known. It is thought that it is made up of solid hydrogen. When pressure rises above a million earth atmospheres, hydrogen atoms are crushed in such a way that their electrons are separated from their nuclei. In this state hydrogen behaves like a metal. It is denser than normal solid hydrogen and like most metals is a good conductor of electricity. Jupiter's core is supposed to be made up of this extraordinary stuff—a metallic version of an element known on earth as the lightest of all gases.

The most conspicuous thing about Jupiter is its *Great Red Spot*: It was first noticed by Cassini in 1665 and observed continuously since 1872. It is an extensive area, about 40,000 km long and 10,000 km wide. The investigations of Pioneer 10 and 11 seem to indicate that this Great Red Spot represents a huge storm—a super-hurricane, existing for hundreds of years, without abating. This storm is probably powered by Jupiter's internal heat.

Jupiter has 14 satellites, the fourteenth having been discovered as late as 1979. The biggest four satellites, Io, Europa, Ganymede and Callisto, were discovered in 1610 by Galileo. They are now collectively called Galilean satellites. The 14th planet discovered in 1979 is also the smallest of the satellites. It has tentatively been named *1971 J1*. It is only a few dozen km in diameter and is about half-way between the surface of Jupiter and the orbit of Amalthea. Amalthea and the four Galilean satellites travel in circular orbits around Jupiter. The remaining 8 satellites are much smaller and travel in irregular orbits. The four outermost satellites, curiously enough, revolve round Jupiter from east to west, contrary to the motions of the great majority of satellites in the solar system and to the revolution of the planets around the Sun. One explanation of the retrograde motion of these satellites is that they were originally asteroids moving about between the orbits of Mars and Jupiter and that Jupiter's gravitational pull had drawn them up. This is quite possible when we consider Jupiter's gigantic mass.

Saturn. Saturn is the outermost planet visible to the naked eye. With a rocky core of the size of the earth, Saturn is the second largest planet (next to Jupiter) but the least dense. It has a density of only 0.69, less than that of water.

Compared to its neighbour Jupiter, Saturn looks unexciting. The two planets are considered very similar—giant balls of hydrogen and helium with hot interiors that provide much of the heat that drives their winds and determines their weather. However, Voyager I has shown that Saturn does have a minor version of Jupiter's Great Red Spot. It has also white ovals and bands of lighter and darker clouds like Jupiter's. Both planets have strong Jet Streams racing round their Equators (see *Atmosphere* infra). Saturn's Equatorial Jet is, however, three times broader than Jupiter's. Its winds are three times stronger too—a thousand miles an hour. The difference in the width and speed of Equatorial Jets, as between Jupiter and Saturn, is accounted for by the difference in the internal heat generated by the two planets. Jupiter generates the same amount of internal heat as it receives from the Sun. Saturn being farther off receives only ¼ of the solar heat received by Jupiter. Saturn compensates for this by releasing a much greater quantity of internal heat. It is this greater internal heat of Saturn that powers its stronger winds.

Rings. The most spectacular feature of Saturn is its system of rings. This has mystified all astronomers from Galileo downwards. The discoveries of Voyager I have only deepened the mystery. Says Bradford Smith, the leader of the team that scans Voyager images, "The mystery of the rings keeps getting deeper and deeper until we think it is a bottomless pit." The Voyager has upset practically all notions of Saturn previously accepted as correct. The Cassini Division, for example, noted by the Italian astronomer Cassini in 1676, has been regarded all these years as a clear zone between the rings. Voyager has shown that far from being clear, the Division is crowded with ringlets. It is now found that trillions of particles ranging from minute pinheads to chunks as big as our biggest buildings populate Saturn's ring system. This is all that can be safely said about them. All the rest is a medley of guesses, doubts and questions.

The rings are today identified by letters A to G. These letters themselves are confounding because the rings are not arranged in any alphabetical order. Thus D ring is closest to Saturn with C coming next, B third and A fourth. Then comes the F ring, followed by G. Last and outermost is the E ring.

The rings display remarkably different characteristics. It is thought that these rings have been formed at different times and shaped by different forces and probably new ones are being still formed. The F ring is unique. It looks as if it has been braided, 'kinked, clumped, split and tied up in knots' as one astronomer puts it.

Moons & Moonlets. Saturn has the biggest family of satellites—a total of 17. Of these 10 were known by 1976. The others were identified by earth-based telescopes and Voyagers I & II from 1979 to 1981. (see S. 17 Satellites *infra*).

The newly discovered moons are rather small and irregular in shape. Apparently they have been formed by the fragmentation of larger bodies. *1980 S 28* is the innermost moon of Saturn and lies at the outer edge of A ring. *1980 S 27* and *S 28*, called the shepherd moons, lie on either side of the F ring. *1980 S 1* and *S 3* are co-orbital moons and come between the F and G rings. *1980 S 13* leads Tethys by about 60 degrees while *1980 S 25* trails Tethys by 60 degrees and *1980 S 6* leads Dione by 60 degrees. These three are called Lagrangian moons since they occupy a position of stability predicted by the French astronomer Lagrange in the 18th century. These are the first known Lagrangian moons.

The shepherd moons are so called because their main function appears to be to herd together the straying particles of rings, just as a shepherd herds his sheep. These moons, big chunks of ice, hold in place millions and millions of ring particles spanning 63,000 km.

The co-orbital moons, so called because they move in the same orbit, form another interesting pair. Their orbital velocities differ with the result that the inner moon slowly overtakes the outer moon. As they approach each other, the inner moon gains momentum and moves into the outer orbit where its speed is reduced. The outer moon at the same time loses momentum and moves into the inner orbit where it gains speed. In short, the two moons change places, the inner moon becoming the outer moon and lagging behind. About once every four years this celestial dance is repeated and the two change places again.

Titan, Saturn's biggest satellite, is known to have an atmosphere. But since Titan is covered up by dense clouds, it is not possible to see what its surface looks like. Titan's atmospheric pressure is 1.6 times that of the earth. Titan's diameter is also found to be only 5140 km, much lower than the previous estimates.

Uranus. Uranus is not visible to the unaided eye. but may be seen through good field glasses. It has five satellites, *Ariel, Umbriel, Titania, Oberon* and *Miranda*. All of them are comparatively small.

In 1977 astronomers aboard the Kupier Airborne Observatory found that Uranus is surrounded by a system of five very faint narrow rings. These rings named Alpha, Beta, Gamma, Delta and Epsilon were at distances of 27860, 28460, 29670 and 30090 miles respectively from the centre of Uranus. The four inner lines—Alpha, Beta, Gamma and Delta—are each about 8 miles wide while Epsilon is many times broader.

All rings are well inside 40,000 miles from Uranus, which is the Roche's limit for Uranus, that is, the limit within which a large satellite would be torn apart by tidal forces.

Uranus was identified as a planet in 1781 by William Herschel and has completed only two revolutions round the Sun since its discovery. This chill methane planet is 14½ times as massive as the earth and has a temperature of about 170°C. It takes some 84 terrestrial years to circle round the Sun and its day is 10 hours 49 minutes. The equator of Uranus is tilted at 98° of the plane of its orbit with the result that it practically rolls on its sides as it revolves round the sun and exposes its polar regions (north and south) to whatever light and warmth the Sun gives in periods of 42 years each.

Neptune. Neptune, between 2900 and 2700 million miles from the earth, is also visible through good field glasses.

The planet was discovered in 1846, as a result of calculations made independently by two astronomers, Adams in England and Le Verrier in France. These calculations gave the position of an unknown planet which was responsible for the perturbations in the motion of Uranus. The planet was found on 23rd Sept. 1846 in the indicated neighbourhood by Gottfried Galle of the Berlin Observatory. It appears to be a pale green orb, no brighter than an 8th magnitude star.

Neptune has only two satellites, *Triton* and *Nereid*. Triton goes round in a retrograde orbit.

Pluto. Pluto, the outermost planet and removed from the earth by a distance between 4700 and 2700 million miles. is visible only through a telescope. This planet was finally located in February 1930 after a long arduous search by C. W. Tombaugh at the Lowell Observatory, Arizona (USA).

Pluto is a tiny sphere, a little larger than Mercury and revolves eccentrically between 4600 and 2700 million miles from the sun. It has no satellites. Its orbit is interlaced with that of Neptune. This has led some astronomers to believe that it is "a run-away" satellite of Neptune. An existing Neptunian satellite, Triton, also appears to have escaped Neptune's hold in the first instance, but had been brought back. This is supposed to be the reason why Triton goes about in a retrograde orbit, opposed to that of Neptune. Pluto appears to have been lost permanently. The latest theory is that Triton, with a diameter of 6000 km and Pluto 5800-6000 km in diameter were two gigantic satellites of Neptune that revolved in the normal manner of satellites. Then owing to some "interaction" between the two—probably they started shoving each other—Triton was pushed into a retrograde orbit and Pluto was pushed out of the satellite orbit. Pluto was thus 'kicked upstairs' to the cadre of a planet.

17. SATELLITES

The satellites or moons revolve round their mother planets or primaries. The solar system is known to have 41 satellites. Of these, Jupiter claims 14, Saturn 17, Uranus 5, Neptune 2, Mars 2 and Earth 1. Mercury, Venus and Pluto have no satellites.

Of Saturn's 17 moons, 10 had already been discovered by 1976. (see Table below). Three were discovered by earth-based telescopes in 1979—80. The rest were discovered by Voyager 1 and 2. The new moons have not been named. They are presently known by numbers as follows: 1980— S 1, S S 3, S 6, S 13, S 25, S 26, S 27 and S 28.

Among satellites our Moon is distinguished in two ways. First, it is an only satellite. All planets other than the Earth either have no satellites or have more than one satellite. Second, the Moon is proportionately the biggest in size compared to the mother planet. Triton, the biggest of the satellites (?), is less than one-eighth of its mother planet, Neptune. Our Moon is one-fourth of the size of the Earth. All other satellites are quite insignificant in size compared with their mother planets.

The list of satellites given below follow the order of their distance from their primaries. The numbers noted against the names indicate their astronomical number. The (R) shows satellites that have a retrograde motion.

Table 17

Satellites

	Satellite	*Average distance from planet (in miles)*	*Period of revolution around planet, days, hours, mins.*			*Discoverer and date*
			Earth			
	Moon	238,866	27	7	43	— —
			Mars			
	Phobos	5,825	—	7	37	Asaph Hall, 1877
	Deimos	14,580	1	6	18	Asaph Hall, 1877
			Jupiter			
xiv	1979 j 1					.... David Jewitt & Edward Danielson, 1979
V	Amalthea	112,000	—	11	57	Edward Barnard, 1892
I	Io	261,900	1	18	28	Galileo, 1610
II	Europa	416,600	3	13	14	Galileo, 1610
III	Ganymede	664,660	7	3	43	Galileo, 1610
IV	Callisto	1,169,000	16	16	32	Galileo, 1610
VI	Hestia	7,130,000	251	—	—	Charles Perrine, 1904
VII	Hera	7,200,000	260	—	—	Charles Perrine, 1905
X	Demeter	7,200,000	254	—	—	Seth Nicholson, 1938
XIII	Unnamed	7,700,000	282	—	—	Charles T. Kowal, 1974
XII	Adrastea (R)	13,000,000	625	—	—	Seth Nicholson, 1951

XI	Pan (R)	14,300,000	714	—	—	Seth Nicholson,	1938
VIII	Poseidon (R)	14,600,000	735	—	—	P. J. Melotte,	1908
IX	Hades (R)	14,700,000	758	—	—	Seth Nicholson,	1914
			Saturn				
X	Janus	99,100	—	17	59	Audouin Dolifus,	1967
I	Mimas	115,200	—	22	37	Sir William Herschel,	1789
II	Enceladus	447,700	1	8	53	Sir William Herschel,	1789
III	Tethys	182,900	1	21	18	Giovanni Cassini,	1684
IV	Dione	234,300	2	17	41	Giovanni Cassini,	1684
V	Rhea	327,100	4	12	25	Giovanni Cassini,	1672
VI	Titan	758,400	15	22	41	Christian Huygens,	1655
VII	Hyperion	918,700	21	6	38	G P. and W. C. Bond,	1848
VIII	Iapetus	2,210,000	79	7	55	Giovanni Cassini,	1671
IX	Phoebe (R)	8,040,000	550	9	—	William Pickering,	1898
			Uranus				
V	Miranda	80,700	1	9	56	Gerard Kupier,	1948
I	Ariel	119,100	2	12	29	William Lassell,	1851
II	Umbriel	165,900	4	3	29	William Lassell,	1851
III	Titania	272,100	8	16	56	Sir William Herschel,	1787
IV	Oberon	363,900	13	11	7	Sir William Herschel,	1787
			Neptune				
	Triton (R)	219,500	5	21	3	William Lassell,	1846
	Nereid	3,461,000	359	10	—	Gerard Kupier,	1949

18. THE MOON

The Moon is the only satellite of the Earth. But it is a satellite of distinction. For, it is the only satellite in the solar system far too big to be a satellite. All other satellites have sizes ranging below ⅛ of the sizes of mother planets. But the moon is about ¼ of the size of its mother planet, the Earth.

Origin of the Moon. The incompatibility of the relative sizes of the Earth and Moon, and their separate existence at such close quarters led to the conjecture that the Moon is not a true satellite but was captured by the Earth during a close approach to the Earth. This theory known as the *Spouse Theory* states that the Moon came from elsewhere in the solar system and sweeping too near, it was snared by the Earth's gravity and "married"—that is, locked into orbit. The second theory known as the *Daughter Theory* says that the Earth once rotated so rapidly that it became blimpshaped and was torn into two, the smaller blob, entering into orbit as the Moon. The third theory—the *Sister Theory*—suggests that the Earth and the Moon were formed more or less at the same time from the original wheeling cloud of cosmic gas that ultimately condensed into the planets and the satellites.

Dimensions. The Moon has a diameter of 2159 miles as against the Earth's 7900 miles. But it has a surface less than half that of the Atlantic Ocean. Therefore its gravitational pull is about one-sixth of the Earth's. Because the orbit of the Moon about the Earth is not circular but elliptical, the maximum distance, (apogee), which the Moon may keep from the Earth is 252710 miles and the minimum distance (perigee) 221463 miles. The Moon revolves round the earth in 27⅓ days (27days 7 hours 43 minutes and 11.47 seconds) and rotates on its own axis in exactly the same time. This is why we see only one side of the Moon.

Topography. To our unaided vision the near side (front side) of the Moon seems to be made up of bright and dark patches. The bright parts are the mountains and highlands that catch the Sun's rays, while the darker patches are low-lying plains. These were once thought to be seas (marias) and named accordingly, though the Moon is devoid of water. The craters are depressions caused by the onslaught of meteors. They vary in size. As if to make up for lack of oceans such as we have on Earth, the Moon has raised high sharp-peaked mountains, many of them rising to 20,000 ft. The highest of these are Liebnitz Mountains, near the Moon's south pole which rise to 35,000 ft., higher than Mount Everest.

The Moon has no atmosphere, as its gravitational power is too weak to hold down gases. This causes many strange phenomena. There is no twilight, the day dawning suddenly, as there is no atmosphere to be lit up before the Sun comes cver the horizon. There is no sound either, as sound is a vibration transmitted through air.

Temperature on the Moon reaches extremes. During daytime the temperature rises to 100°C, at night it comes down to minus 180°C.

The Moon along with the Sun is responsible for the tides. The Moon, being nearer to the Earth than the Sun, exerts a greater influence on the tides. It takes only 1.3 seconds for moonlight to reach the Earth, whereas sunlight takes as much as 8 minutes 16.6 seconds to reach us. This being so, the ratio of lunar and solar power for tide-raising is 11 to 5. (Also see *Hydrosphere)*.

APOLLO XI AND AFTER

Apollo XI which landed two men on the Moon in July 1969 has blazed a new trail in man's exploration of space. It has enabled man to step on to the surface of the Moon—a possibility that the wildest legends of early times had discounted. USA has followed up this initial success by Apollo XII, Apollo XIV, XV, XVI and XVII.

— Meanwhile, USSR has sent up the unmanned Luna 16 (Sept. 12, 1970) and Luna 17 (Nov. 19, 1970). Luna 16 picked up Moon soil samples and returned to the Earth on September 24, 1970. Luna 17 carried the Moon buggy Lunokhod 1, which roved the surface of the Moon. It was an eight-wheeled vehicle, which carried apparatus to study the lunar surface and radioed back the results to the Earth.

All these manned landings on the Moon and the investigations of the unmanned spacecraft like the Lunas, haven't solved the lunar puzzles. The question of the origin of the Moon and whether it is a daughter, sister or spouse of the Earth still remains unsettled.

However, the oldest rocks and soil samples brought back by the Apollo astronauts have shown that the Moon is about the same age as the Earth and was formed about 4600 million years ago.

Apollo Discoveries. Among the 6 Apollo missions that actually landed on the moon, the first two were confined to the maria or lowlying portions and the others to highlands and areas of varied terrain like rills (narrow valleys). The Apollo missions have brought back nearly 800 pounds of lunar rocks which are being analysed and studied.

The most striking aspect of the moon's appearance is the abundance of craters on its surface. They range in size from circular basins 1000 kilometres (about 620 miles) in diameter down to craters measuring less than a few metres or feet across. The majority of these craters have been produced by a continuous rain of meteorites over the eons.

The earth has also been subjected to meteoric bombardment, but the erosive action of winds and water, volcanic activities and earthquakes have obliterated evidences of meteoric impact on the earth. Because these forces are absent on the moon's surface, the lunar surface has preserved a record dating back to the time of the Moon's formation.

Moon Rocks. The first landing sites (Apollo 11 and 12) were *mare* areas. The rocks from this area turned out to be basaltic lava, similar to volcanic rocks found on earth.

A surprising finding was the occurrence of a high percentage of titanium. While terrestrial igneous rocks contained only about 1 per cent of titanium, the lunar rocks showed 10 times as much. A few minerals unknown on earth were found in the mare basalts. Among these is *Armalcolite*, a new name derived from the names of the astronauts—*Armstrong*, *Aldrin* and *Collins* and the name of the area *Tranquillititis*.

The lunar rocks were bone-dry, with no trace of water in any form. Neither did they contain any trace of any organic matter. So, also, volatile elements (elements with low boiling points) like sodium, potassium, chlorine, germanium, lead and mercury were practically non-existent. The depletion of sodium and potassium is significant, because these two are among the most abundant elements found in terrestrial rocks.

The oldest rock recovered from the Moon was found at *Descartes* highland where Apollo 16 landed. It is 4.25 billion years old. On our present evidence this may be taken as the earliest date on which the surface of the Moon solidified.

Moonquakes, recorded by seismometers left by the Apollo Missions, run into hundreds. Some are the results of meteor impacts, others are landslides of the inner slopes of craters. But many are true lunar quakes. The magnitudes of these quakes, however, go up only to 2 on the Richter scale with 1.5 the smallest tremor that can be felt.

One peculiarity of these moonquakes is that they occur most often when the Moon approaches closest to the Earth. This means that the Earth's gravity exerts a forceful tidal pull on the Moon that causes the rocks in its interior to slip against each other and produce jarring vibrations.

The evidence so far gathered shows that the moon was hot and geologically active during the first 1.5 billion years of its existence. It is not known whether the entire moon was then molten, but at least a layer 200 to 300 kilometres thick near the surface must have melted in order to produce the rocks found there. Gradually the surface layer cooled, but at the same time the interior warmed up because of heat released by radio-active decay. Rocks in the interior melted and were extruded on to the surface in a series of lava flows. This melting effect lasted until about 3.1 billion years ago. Then the moon's interior cooled, and except at very great depths it has remained rather cold and geologically inert ever since.

Table 18

Constants of the Moon's Size and Motions

Synodic month (relative to Sun)	29.53059 days
Sidereal month (relative to stars)	27.32166 days
Mean inclination of orbit to ecliptic	58′ 43″
Inclination of Moon's equator to ecliptic	1.32″
Mean distance from Earth	238,855 miles
Diameter	2159.9 miles
Diameter in terms of Earth's diameter	0.27250
Mass in terms of that of earth	1:81.30
Density in terms of water	3.34
Density in terms of Earth	0.6058
Ratio of gravity to gravity at the Earth's surface	0.166
Fraction of Moon's surface always invisible	0.410

19. COMETS

The word Comet is derived from the Greek *aster kometes* meaning long-haired star. The long hair is the tail which looks like hair blowing in the wind. The head or the *coma* is the star.

Comets have been associated with disasters from the earliest times. It is not known how comets—alone of all astral bodies—came to be treated as evil portents.

Origin. Most astronomers have now come to believe that comets are primordial remnants from the formation of the solar system. They have their home in the cold outer fringe of the solar system away from the outermost planet. In this cold dark domain, where the Sun looks no brighter than a distant star, millions of cometary nuclei are congregated. Most of them are a mile or so in diameter, though some may reach diameters of 50 miles or more. Here, the comets are non-luminous and have no tails and move slowly in enormous orbits around the far distant Sun. But now and then, gravitational changes (e. g. the gravitation of the stars they pass by) shake out some comets from their slow orbits. Some of these move out into the interstellar space and are lost to the solar system. Others move into the solar system eventually to become the brilliant long-tailed comets that we see from the Earth.

Structurally, a comet consists of three parts, a nucleus, a head and a tail. The *nucleus* is a tiny object, only a few kilometres in dimension. It is made up of ices of various compounds like ammonia, water, dust and larger particles. It reflects sunlight and appears as a bright spot in the centre of the head. The *head* is comparatively big extending up to a million kilometres. It is made up of gas and microscopic dust particles. The *tail*, which is the distinguishing feature of the comet, is much larger than the head, extending to a length of 20 to 30 million kilometres.

The comet does not possess its typical head and tail when it is far away from the Sun. The head appears when it comes near Jupiter's orbit, and the tail develops when it crosses the orbit of Mars. The evaporation of the solid ice material around the nucleus, when the comet approaches the Sun, is responsible for the appearance of the head. At the same time, solar wind is driving away the gaseous matter attached to the head. This explains the streaming tail.

Orbits. A comet may have three kinds of orbits. If the comet approaching the Sun does not have enough speed to overcome the Sun's gravity, it will settle down in an *elliptical* orbit like our earth. A comet which has just enough speed to counterbalance the Sun's gravity will take on a *parabolic* orbit. If a comet is fast enough to overcome the Sun's attraction, it will describe a *hyperbolic* orbit and escape into interstellar space.

Comets that keep re-appearing in the solar system are said to be *periodic* comets. As they come near the Sun, they whip around it at enormous speeds and shoot away from the Sun, with their tails pointing ahead.

The periodic comets are divided into two categories, the short period group and the long period group. The short period group has periods of less than 200 years each. The long period groups have periods going up to thousands of years. *Halley's Comet*, named after the English astronomer Edmund Halley, reappears every 76.3 years. The *Great Comet* of 1811 comes back once in 3000 years, the comet of 1844 in something more than 100,000 years while the comet of 1864 takes as much as 2,800,000 years to return.

It is estimated that the solar system may contain as many as 100,000 comets. But most of these stay at home, so to speak. Only very few comets stir out into interplanetary space and move around the sun. Till 1974, according to an official catalogue, 611 comets were reported starting with Halley's Comet in 87 B. C. Out of these, 513 are long period comets which do not return for 200 years or more. The remaining 98 are short period—less than 200 years between visits. Sixtyfive of these have been sighted more than once since they were noticed first. The most frequent visitor is Encke, first seen in 1786. Its period is so short (3.3 years) that it has returned 65 times since then.

New comets appear on the horizon now and then. On an average about half a dozen new comets are discovered every year. In certain years the number goes up to more than a dozen. Thirteen comets were spotted in 1932 and 1947.

Comets are named after their discoverers. Thus the comet which appeared on Feb. 27, 1975 has been named *West-Kohoutek-Ikemura 1975 B*, apparently because three persons noticed the comet more or less simultaneously. The comet which appeared on March 7, 1975 has been named *Kohoutek 1975 C*, after Dr. Lubos Kohoutek of the Hamburg Observatory (West Germany). The letters B and C indicate that they were the second and third comets which appeared in 1975. *Kohoutek C* is not expected to return for another 75,000 years.

Table 19

Some Famous Comets

Year and No.		*Name of Comet*	*Period, Years*
1744		De Cheseaux's Comet	....
1806		Biela's Comet	6.7
1811	I	Great Comet of 1811	3000
1812		Di Vico's Comet	70.7
1815		Olber's Comet	74.0
1819	I	Encke's Comet	3.3
1819		Pons-Winnecke Comet	6.0
1835	III	Halley's Comet	76.3
1843	I	Great Comet of 1843	512.4
1844	II	Great Comet of 1844	102.050
1858	VI	Donati's Comet	2040 (?)
1864	II	Great Comet of 1864	2,800,000
1871	III	Tuttle's Comet	13.8
1874	III	Coggia's Comet	6000(?)
1879		Brorsen's Comet	5.6
1881	II	Tebbutt's Comet	....
1889	VI	Swift's 2nd Comet	7.0
1892	III	Holme's Comet	6.9
1911	IV	Halley's Comet	76.3
1923		d' Arrests' Coment	6.6
1925	II	Comet Schwassmann-Wachmann	16.2
1975		Comet West	1,000,000*

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* Comet West, discovered by Dr. Richard West of the European Southern Observatory at Chile in 1975, sported a gigantic tail 1 million km long.

Every time a comet passes near the Sun, it loses some matter which clusters together in space. The gas and dust escape first, leaving the solid core of the head. Sometimes, the core itself disintegrates leaving a stream of small particles that gradually spread out in space. Every year the Earth passes through several clusters of these cometary fragments or cometary material, whose broken pieces shine briefly as shooting stars in the night sky (See *Meteors)*. Sometimes the head escapes disintegration. It will then resemble a small asteroid. Some astronomers think that many of the asteroids are made up of such dead comets.

20. ASTEROIDS

The *asteroids*, also called *planetoids*, are swarms of tiny planets, revolving round the Sun, mostly between the orbits of Jupiter and Mars. This region is called the asteroidal belt and extends from 2.2 to 3.6 AUs (Astronomical Units). Their total number is estimated to be between 40,000 and 50,000. They are really nothing more than masses of rock revolving round the Sun.

In 1801 an Italian, Giuseppe Piazzi, discovered a star-like body beyond the orbit of Mars where a 'missing planet' was supposed to be located. Named *Ceres*, it proved to be the first and largest of the asteroids. Ceres, an airless lifeless ball 955 km in diameter, is large enough to be called a planet. A few others later discovered—*Pallas, Vesta, Juno, Hebe* and *Iris*—are fairly big. But the great majority are irregular chunks, around a mile or so in diameter.

The first ten asteroids discovered in the first half of the 19th century are also the biggest. New asteroids are being discovered every day. The new asteroids are given permanent numbers and usually also named by a central authority, now at the Cincinnati Observatory, USA. As on 1st Jan. 1973, 1813 objects have been counted in the asteroidal belt and their numbers assigned* (*Science Today*, Aug. 1973).

The main asteroidal belt, a collection of thousands of rocky bodies, lies between Mars and Jupiter. The majority of these are closer to Mars than to Jupiter. Ceres and all the other big asteroids are found here.

Apollo & Trojan Asteroids. The asteroids form two groups *Apollos* and *Trojans*. The Apollos form a small group of 19 small asteroids, one of which named Apollo has lent its name to the whole group. They range in diameter from 200 metres to as much as 6 km. Most of the Apollos cross the orbit of the Earth in their circuits round the Sun.

Trojans are another group of asteroids that travel in Jupiter's orbit in step with Jupiter and in such a way that Jupiter, the Sun and the asteroids form an equilateral triangle. Such triangular arrangements which remain stable are theoretically possible among astral bodies but this is the first example of an actual triangular positioning so far known. *Achilles*, the first of the Trojans, was discovered in 1906 by the German astronomer *Franz Joseph Wolf*. About 1000 Trojans are now known. The Trojans are the darkest of the asteroids.

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* Of these, 1562 were discovered by two German astronomers, Wolf (582) and Reinmuth (980).

5

Colliding Asteroids

Although no asteroid is known to have collided with the earth in historical times, such collisions are thought to have occurred in the pre-historic past. Luis Alwarez, 1968 Nobel prize winner for Physics, holds that a 10-kilometre asteroid struck the earth 65 million years ago, wiping out 70% of the plant and animal life. The dinosaurs disappeared in this catastrophe. When the asteroid crashed, the material from the explosion covered the earth and took about 3 years to disperse.

Two facts support this view. 1. According to Ian Halliday, a Canadian astronomer, there are about 13,000 Apollo asteroids, moving in orbits fairly close to the earth. Of these only 30 have been identified so far. 2. Paleontologist Dale Russell (Canada) says that studies of about 5000 dinosaur skeletons showed no evidence that they became extinct in the natural course of evolution. Some sudden catastrophe must have wiped them out. Alwarez claims that he and his co-workers at Berkeley, California, have "demonstrated conclusively that a body coming from the solar system caused the catastrophe."

Source: A. P. Report, Ottawa, May 22, 1981.

Table 20
First Ten Asteroids

Name	year of Discovery	Mean distance from sun (million miles)	Orbital period (year)	Diameter (miles)
Ceres	1801	257.0	4.60	485
Pallas	1802	257.4	4.61	304
Juno	1804	247.8	4.36	118
Vesta	1807	219.3	3.63	243
Astrea	1845	239.3	4.14	50
Hebe	1647	225.2	3.78	121
Iris	1847	221.4	3.68	121
Flora	1847	204.4	3.27	56
Metis	1848	221.7	3.69	78
Hygeia	1849	292.6	5.59	40 (?)

Earthgrazers. Some asteroids in their orbits round the sun come dangerously close to the earth (in astronomical dimensions). They are called *earthgrazers. Eros,* first identified by photographs in 1898, is the first of the earthgrazers to be discovered. It may come as close as 22 million km (14 million miles). Another asteroid *Hermes*—just 1000 feet across—passed within 485,000 miles of the earth in 1937. *Icarus,* a lump of rock almost a mile in diameter, came within 4 million miles of the earth in 1949 when it was first discovered. It repeated the performance in 1968. *Geographus,*[†] a curious cigarshaped rock about 2½ miles long and half a mile wide (discovered in 1951), came within 5.6 million miles of the earth in 1969.

[†] So called after the National Geographic Society.

21. METEOROIDS

Meteoroids are lumps of solid matter that cross the inter-planetary space in endless numbers. The word 'meteoroid' is a general term that includes *meteors, fireballs, meteorites* and *micrometeorites*. Meteoroids are usually very small in size, considerably smaller than the asteroids. Their source is not exactly known. It is thought that they are broken pieces of comets or bits of disintegrated asteroids.

Meteors, commonly known as 'shooting stars', are meteoroids that pass through the atmosphere and become hot enough to emit light. They are heated as they pass through the air by a process of compression. Unconfined (free) air cannot move faster than the speed of sound, while meteoroids tear through it at 30 to 60 times the speed of sound. This naturally causes compression of the surrounding air which gets heated. Much of this heat is absorbed by the passing meteoroids which shine as meteors or shooting stars.

Meteor Showers. These are supposed to be fragments of comets. They come down in clusters and get burnt out in the atmosphere thus giving the appearance of a shower. In 1964, the comet *Giacobini-Zinner* passed close to the Earth missing a collision by about ten days. The Earth, however, passed through the broken fragments of the comet, with the result that the sky teemed with shooting stars. Meteor showers, that recur periodically, are apparently remnants of disintegrated comets. The *Perseid* shower which occurs annually in August is taken to be remnants of *Tuttle's* comet, first discovered in 1871. The *Leonid* shower which falls every 33 years is suspected to be fragments of *Temple's* comet. The *Leonid* shower of 1833 is the greatest meteor display we have so far seen.

Fireballs, so called, are exceptionally bright meteors. Some think that fireballs have a different origin from that of the ordinary shooting stars. They are supposed to come from the belt of asteroids.

Meteorites. Every day millions of meteoroids pass into our atmosphere but not more than one or two a day survive the compression and strike the earth as meteorites. The rest are burnt up in the atmosphere or reduced to meteoric dust. The largest meteorite known is imbedded in the ground near *Grootfontein* in S. W. Africa. It is estimated to weigh 70 tons. The second largest, weighing some 34 tons, was recovered by *Admiral Peary* from Greenland. It is now on exhibit at the *Hayden Planetarium* in New York. Though no meteorite larger than the Grootfontein is known to exist, the Earth must have been struck by bigger meteorites. This is evidenced by large meteoric craters that exist today. The largest of such craters known is at *Lac Couture,* Quebec, which is more than 9 miles across. The crater lies submerged in a lake.

Composition of Meteorites. Meteorites are broadly divided into three groups which differ widely in both appearance and properties. (1) Stones or *Aerolites,* (2) *Iron* or *Siderites* and (3) Stony-irons or *Siderolites.* The chief elements in stone meteorites are oxygen, silicon, iron, magnesium, aluminium, calcium, sodium, sulphur and nickel. Iron meteorites are practically an alloy of iron, nickel (7 to 8%) and cobalt (about 0.5%). Graphite, iron sulphide and phosphorus are also found in varying quantities in iron meteorites. Sometimes, even diamonds are found. The stony iron meteorites contain, besides iron and nickel, a number of silicon minerals, in varying proportions.

Micrometeorites. The smallest meteoroids are called micrometeorites. They are so small that they do not become incandescent by compression and drift slowly down to the earth in their original forms. Huge quantities of this meteoric dust fall on the Earth year after year. It is estimated that meteoric dust falling on the Earth will add up to more than 2 million tons of dust every year.

Tektites are believed to be extraterrestrial material and are therefore classed with meteorites. They resemble glass pieces. Chemically they resemble nothing on Earth but their most interesting feature is that they appear to have had a fiery high speed journey through our atmosphere. Their surfaces are etched and pitted by atmospheric friction—by a process called ablation. Usually about the size of gravel, tektites are found in widely separated regions of the world known as 'skewn fields'. The exact source of these tektites is unknown.

The largest tektite of which details are available is the one found in Laos, *circa* 1932. It weighs 7.04 lbs and is now in the Paris Museum.

22. THE EARTH

1. Geocentric Theory. The earliest systematic theory of the earth was the geocentric (geo=earth) theory. According to this theory, the earth was the unmoving centre of the universe, round which the sun and the stars and all other heavenly bodies revolved. One of the earliest proponents of this theory was Euodoxius of Cnidos, circa 360 B. C. Many Greek philosophers disagreed with this view. Aristarchus of Samos (310-230 B. C.), for example, held that "the fixed stars and the sun remained unmoved, that the earth revolved round the sun on the circumference of a circle, the sun lying at the centre of the orbit". However, the ideas of Aristarchus and others like him never gained currency.

The final formulation of the theory was made by Claudius Ptolemy, a Greek astronomer of Alexandria. He brought out an encyclopaedic work on astronomy in about 140 A. D. This work, later known by its contracted Arabic name *Almagest*, remained the Bible of astronomy for another 1400 years. Looking back, it seems incredible that such a fallacious theory should have ruled for so long a time. Actually, the theory enjoyed this longevity, because it had two attractive features. First, it agreed with the apparent (not real) movements of the heavenly bodies. This satisfied the popular minds. Second, it flattered man's vanity to think that his abode—the earth—was the centrepiece of the universe.

2. Heliocentric Theory. The heliocentric theory (helios=sun) was first advanced by Nicolaus Koppernigk (1473-1543), a Polish astronomer, better known by his Latinised name Copernicus. In 1543 Copernicus published a book *De Revolutionibus Orbium Coelestium* in which he set out the theory that the sun was the centre of the universe and that the earth and other planets revolved round it. Wrote Copernicus, "In the middle of all dwells the Sun. Who indeed, in this most beautiful temple, would place the torch in any other or better place, than one, whence it can illuminate the whole at the same time? Not ineptly, some call it the lamp of the universe, others its mind, others again its ruler. . . ."

Like all other astronomers of the day, Copernicus believed that the solar system was equivalent to the universe. This was a mistake which was corrected only in recent times. He was also mistaken in assigning circular orbits to the planets. This mistake was corrected by the German astronomer Johann Kepler (1571-1630) in 1609. For the rest, the Copernican theory was sound and unassailable.

Nevertheless, the theory faced stormy weather. For the better part of a century disputations went on between the Copernicans and the Ptolemians, with the

Copernicans remaining on the defensive. Even the Danish astronomer Tycho Brahe (1546—1601), the most celebrated astronomer of the times, rejected the heliocentric concept. It was left to the Italian astronomer, Galileo Galilei (1564—1642) to save the Copernican theory from extinction. Galileo fought a lifelong battle in defence of the Copernican system. Before he died he had the satisfaction of knowing that the tide had turned and that the Ptolemians were on retreat.

Sir Isaac Newton (1642—1726) dealt the last blow at the geocentric theory. He formulated the law of gravitation and correlated it with his laws of motion. His book *Philosophiae Naturalls Principia Mathematica* (known shortly as *Principia)* marks a turning point in the history of astronomical thought.

3. Modern Theories. Modern theories of the formation of the Earth and other planets are of course based on the Copernican theory. In 1749, the French naturalist Comte de Buffon argued that the planetary system originated as the result of a collision between the Sun and a comet that came out from the depths of space. In 1775 the German philosopher Immanuel Kant advanced what has since been known as the nebular hypothesis. He suggested that the Earth and the other planets were condensed from a rotating nebula of gas centred in the Sun (solar nebula). The French mathematician Marquis de Laplace supported the nebular hypothesis in 1796. Around 1900 two American astronomers, T. C. Chamberlin and F. R. Moulton, offered an altered version of Buffon's theory. They argued that a star (not a comet) passed by the Sun and drew out the material that later condensed into planets.

Neither Buffon's thesis nor that of Chamberlin and Moulton could hold out for long. But Kant's hypothesis received further support. In 1943 the German scientist von Weizacher came out with a restatement of the nebular hypothesis. He was supported by the American astronomer Kupier. They argued that the entire solar system originated from a massive wheeling cloud of gas and dust some 6 billion years ago. The central mass of this rotating disc of gas formed the sun. Because of its intense pressure and temperature, the sun produced light, heat and other radiation through nuclear reaction. The clouds on the periphery of the central mass (sun) condensed to form the planets and other celestial bodies of the solar system—all of which were held together by the gravitational pull of the sun.

Age of the Earth. The age of the earth was a matter of speculation till very recent times. Imagination played a very great part in this process. Naturally, the conclusions varied greatly. Thus an old Russian calendar put down the age of the earth at a mere 2000 years, while a Hindu calculation (quoted by Prof. Arthur Holmes) put it down at 2000 million years. In 1658, an Irish bishop, James Ussher, set out to fix the exact age. He calculated on the basis of the Bible that the earth was created on Sunday, the 23rd October, at 9 a.m. in the year 4004 B.C.

It was only about 200 years ago, that scientific enquiries were started by geologists. According to their deductions, based on the study of rocks, the age of the earth is estimated to be around 4600 million (4.6 billion) years.

Table 21

Earth Data

Superficial area	196,950,000	sq miles
Land surface	57,510,000	,,
Water surface	139,440,000	,,
Equatorial circumference	24,902	miles
Meridional circumference	24,860	,,
Equatorial diameter	7,926.677	,,
Equatorial radius	3,963.34	,,
Mean distance from the Sun	92,857,000*	,,
Time of Rotation on its own axis	23 hrs. 56 min., 4.09 sec.	
Period of Revolution round the Sun	365 days 5 hrs. 48 min., 45.51 sec.	
Inclination of the axis to the plane of the ecliptic	23° 27′	
Speed of Rockets (that is, velocity required to counter earth's gravity and to rise up into the atmosphere)—	A minimum of 8 km (5 miles) per second.	
Escape Velocity (that is, speed necessary to break away from the earth into outer space)—	11 km (7 miles) per second.	

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* (This is now known as Astronomical Unit, A. U.)

23. THE STRUCTURE OF THE EARTH

Our knowledge of the internal structure of the earth is derived from studies of earthquakes. The shock waves sent out by an earthquake indicate the physical nature of the regions through which they pass. These studies show that the centre of the earth is a solid core—the *Inner Core*. The density of this core is about 13 gm to the cubic centimetre. The Inner Core is about 1300 km thick and is surrounded by an *Outer Core* of around 2080 km. The Outer Core appears to be molten.

The Outer Core is surrounded by the Mantle which has a thickness of around 2900 km. The Mantle is topped by the crust of the earth, which varies widely in thickness—from 12 to 60 km. At the centre or the Inner Core, that is at a depth of some 6370 km, temperature goes up to some 4000°C and pressures reach nearly 4 million atmospheres.† (See *Air Pressure—Atmosphere*-infra).

The Mantle. The mantle is important in many ways. It accounts for nearly half the radius of the earth (2900 km), 83 per cent of its volume and 67 per cent of its mass. The dynamic processes which determine the movements of the crust plates are powered by the mantle.

Starting at an average depth of from 45 to 56 km below the top surface of the earth, the mantle continues to a depth of 2900 km where it joins the outer core. The mantle is a shell of red hot rock and separates the earth's metallic and partly melted core (both the inner and the outer cores) from the cooler rocks of the earth's crust. It is composed of silicate minerals rich in magnesium and iron. The density of the mantle increases with depth from about 3.5 grams per cubic centimetre to around 5.5 grams, near the outer core.†

The upper portion of the mantle, about 250 km thick, is called the *Asthenosphere*. Here the rocks are partially melted, with thin films of liquid distributed between the mineral grains. The red hot nature of the lower mantle and the partially melted nature of the upper mantle (Asthenosphere) combine to make the whole mantle plastic or yielding. It is on this plastic base that the top crust of the earth (consisting of oceans and continents), that is to say the lithosphere, rests. The lithosphere is distinguished from the asthenosphere by the fact that it is cooler and therefore more rigid.

The crust of the earth which tops the lithosphere virtually floats on the asthenosphere. Like other floating bodies the crust seeks an equilibrium riding deeper where it is heavier and rising higher where it is lighter. The mountains on the crust have deep roots of light material to support them and when the load on any part of the crust changes, the surface responds by rising or sinking to restore the equilibrium.

The Outer Surface. The outer surface of the earth is divided into four spheres:

1. **Lithosphere** means the entire top crust of the earth and includes not only the land surface but also the ocean floor.
2. **Hydrosphere** is the water surface which includes the oceans, lakes and rivers. It rests on the lithosphere.
3. **Atmosphere** is the blanket of air that envelops the earth. It covers both the land surface and the water surface.
4. **Biosphere** is the sphere of life which spreads over all the three other spheres, lithosphere, hydrosphere and atmosphere.

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† Source: *Scientific American*.

8

The Midnight Sun

One of the spectacular effects of the Earth's tilted axis is the Midnight Sun. In the northern hemisphere, when the earth's axis leans towards the Sun, the lands lying within the Arctic circle rotate for a time entirely in the light. So this part of the world has continuous day for some months. The days of light in the Arctic are called the Arctic Summer. During the nights of the Arctic Summer the sun circles round and round in the sky but never goes below the horizon. It looks as if it is going to set, but at midnight it starts to rise again. This is the Midnight Sun. The northern portion of Norway lies within the Arctic circle and experiences the phenomenon of the Midnight Sun. Norway is, therefore, called the 'Land of the Midnight Sun'.

24. LITHOSPHERE

The lithosphere is the top crust of the earth on which our continents and ocean basins rest. It is thickest in the continental regions where it has an average thickness of 40 km and thinnest in the oceans where it may have a maximum thickness of 10 to 12 km. It constitutes about 1 per cent of the earth's total volume and 0.4 per cent of its mass. Though the lithosphere technically includes both the land mass and the ocean floor it is often used to indicate only the land surface, especially where it is sought to be distinguished from hydrosphere or the water surface. Regarded thus, the lithosphere forms only 3/10 of the total surface of the earth. The rest 7/10 is taken up by the oceans.

Land Surface. As we see it today, the topmost portion of the land surface is sand and soil,* except where rocky outcrops show. All of the sand and much of the soil that we see have been derived from ancient rocks. The rocks themselves were originally formed from the molten magma, which erupted from the interior of the earth. Powerful earth movements have heaved up some of the rocks to the top surface, where they have been exposed to climatic influences. The process by which rocks are broken down into sand is known as 'weathering'. Many factors operate to weather down the rocks, of which the most important is 'weather' itself.

When rocks heated hot by the sun are suddenly cooled by rain they crack. When the process goes on for thousands of years big rock formations crumble down as sand. Similarly frost can break down rocks. Water caught in the crevices of rocks turns to ice in winter conditions and expands. This pressure often cleaves rocks. These and other conditions have combined to produce the land formations that we see today.

Rocky Substructure. The contours of the landscape are largely conditioned by the rocky substructure of the lithosphere. Geologically speaking, all materials that make up the crust of the earth are rocks, whether they are big granite boulders, combustible coal, soft clay or loose fragments of gravel or sand. Rocks which form the lithographic substructure may be broadly grouped into three classes— 1. *Igneous rocks,* 2. *Sedimentary rocks,* and 3. *Metamorphic rocks.*

Igneous rocks are formed out of the molten magma from the interior of the earth. Ninetyfive per cent of the earth's crust is made up of these rocks. Three types of igneous rocks may be noticed here, *Granite, Basalt* and *Volcanic*. Granite is the major rock in continental formations. Basalt largely occurs in ocean beds. Volcanic rocks, as the name implies, are formed from the molten lava ejected by volcanoes.

Sedimentary rocks are so called because they are formed from the sediments deposited in the ocean beds (see S. 32 Ocean Floor). They comprise only 5 per cent of the earth's crust but cover about 75 per cent of the land surface. Sedimentary rocks are not important structurally but economically. It is from these rocks that we get our coal, oil and some valuable minerals. Sedimentary rocks are mainly made up of the weathered remains of igneous rocks but they also contain much organic matter formed from the remains of microscopic marine organisms and dead wood or other vegetable matter (see S. 70 Coal, 71 Oil). Sedimentary rocks are formed in horizontal layers called strata and take millions of years to harden into rocks. Once formed, these rocks are often rolled up or deformed and shifted about by earth movements and are sometimes located in the most unlikely places, the top of the Himalayas, for instance.

Metamorphic rocks are rocks transformed by the action of intense heat or great pressure or chemical activity on rock formations *in situ*. Both igneous and sedimentary rocks are liable to be metamorphosed. Metamorphism is often associated with volcanic activity or the extrusion of molten or hot gases into pre-existing rock formations. Marble, for example, is formed by the action of intense heat on limestone. Slate is formed from the compression of shale and mudstones.

Climatic Regions. The Lithosphere is divided into twelve climatic regions as follows:

1. Polar Regions. They are permanently ice-clad and possess hardly any

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* Soil is distinguished from sand because soil contains humus or decomposed organic matter (dead leaves, roots, etc.) which provides nutrients for plants. Sand as such does not contain humus.

vegetation and very little animal life. 2. Next to the polar regions is the Tundra region with permanently frozen subsoil, mainly cold except for brief summer periods. This area is marked by mosses and lichens and other stunted vegetation with a few bushes in the warmer centres. 3. Moorland, where the subsoil is not frozen except in winter. The surface generally is rocky and the main vegetation is short shrubs and tufted grass. 4. Coniferous forests, which are under snow for a few months, and which experience very low temperatures with little rainfall. 5. Deciduous forests, which have warmer temperature and greater rainfall than the coniferous forests. 6. Temperate grasslands, which are fairly wet with no extremes of temperature and where grass and trees grow in profusion. 7. Prairie regions, with extremes of climate and scanty rainfall, mainly suited for extensive mechanised farming and grazing. 8. Mediterranean regions. This does not mean regions round the Mediterranean, but the areas of the earth, with typical Mediterranean climate of warm wet winters and hot dry summers and best suited for the cultivation of olives, vines etc. 9. Savannah or hot grassland region, found in the tropics with high temperatures, and small hardy vegetation like grass and stunted trees. This region will appear yellowish brown during the dry season and fresh green in the wet season. 10. Tropical forests are regions of great heat and moisture, with very luxuriant vegetation and high-growing trees. 11. Semi-desert areas, with scanty and intermittent rainfall, which usually experience great extremes of temperature. Vegetation here is sparse, consisting of salt brush, scrub and other stunted plants. 12. Deserts, with little or no rainfall and great extremes of temperature, between day and night and by seasons. These are barren, rocky or sandy places with no vegetation except in patches called oases where there are supplies of water.

25. CONTINENTAL DRIFT

Alfred Wegener. We know that the face of the earth, that is, its visible surface has undergone radical changes in the past. Geologists explained these changes as the consequences of the cooling and contraction of the earth, through thousands of years. This explanation seemed quite unsatisfactory to a German scientist, Alfred Wegener (1880-1930). In 1915, Wegener published a book *The Origin of Continents and Oceans* in which he advanced a new theory, the theory of *Continental Drift*.

This theory claimed that the changes in the appearance of the earth were, in the main, due to the shifting of continents. Wegener grounded his theory primarily on two premises. First, that the geological formation and fossil remains of the present far away continents showed striking similarities. Second, that some of the continents showed astonishingly complementary coastlines. The east coast of South America, for example, matches the west coast of Africa, so finely that they would fit together exactly, if they were brought together.

Wegener was no geologist. He was a qualified astronomer who practised meteorology. Though one or two geologists—Prof. Arthur Holmes, for instance—supported him, the majority of the geologists condemned his theory as absurd. Wegener died a discredited man. But researches in oceanography in the sixties clearly showed that the theory of continental drift was substantially right. It is now generally accepted that the continents, far from being immutably fixed in their positions, have been constantly on the move throughout geological history and are still shifting.

PANGAEA AND PANTHALASSA

All Lands universal ocean

According to the theory of continental drift, there was only one continent and one ocean, about 250 million years ago. Wegener named this continent *Pangaea* (meaning all lands) and the ocean *Panthalassa* (meaning universal ocean). Pangaea was a supercontinent, which contained all our present continents. Pangaea covered an area of about 150 million sq. km. It spread equally between the two hemispheres. (Today, two-thirds of all the lands lie in the northern hemisphere).

Pangaea consisted of North America (with Greenland attached) and Eurasia (minus Arabia and India) in the extreme north; and below it, South America and Africa (with Arabia attached); and further down, Antarctica, Australia and India. Between North America and Eurasia, the rudimentary Arctic Ocean formed a big gulf in the north, while between Eurasia and Africa lay a long large bay, the Tethys Sea, the ancestor of the Mediterranean.

The break-up which has resulted in the formation of present-day continents and oceans began about 200 million years ago by two extensive rifts in the north and south. The *northern rift* cut Pangaea from east to west, along a line slightly north of the Equator creating *Laurasia* in the north and *Gondwana* in the south. Laurasia consisted of North America and Greenland and Eurasia (without India and Arabia), while Gondwana contained Africa with Arabia attached, South America, Australia, Antarctica and India. The rift opened up the Atlantic Ocean. The *southern rift* cut up Gondwana into (i) South America and Africa-cum-Arabia and (ii) Antarctica, Australia and India. This rift opened up the Indian Ocean.

About 135 million years ago, a Y-shaped rift liberated India from the Antarctica complex and India started on a lone voyage to the north. Some 65 million years ago, North America separated from Eurasia, and South America from Africa. The two Americas drifted west while Africa edged towards the north. Later, the drifting Americas (North and South) came together, united by the Isthmus of Panama, while Australia cut adrift from Antarctica and moved northwards. About 20 million years ago, Arabia split from Africa to merge into Asia. This brought into existence the Red Sea and the Gulf of Aden.

India. Having separated from Antarctica and Australia, about 135 million years ago, India undertook a most remarkable journey to the north. On the way, the Indian Plate encountered a hot spot (a huge geyser) near the equator. As it passed over the hot spot, basaltic magma from the earth's mantle, poured out (through the hot spot) on to the Indian sub-continent over its western edge. The basalts of the Deccan plateau were thus formed. Then India moved on and careened into south Asia about 45 million years ago. The northern margin of the Indian plate dipped into the Tethys Sea and slid under the southern edge of the Asiatic plate.

This subduction produced vast geological transformations in South Asia. (1) It filled up the Tethys Sea at its eastern end and thus formed a land mass in the place of the sea. The western end of the Tethys Sea remained unaffected and subsequently emerged as the Mediterranean Sea. (2) It put up the Tibetan plateau and the Himalayan mountains. It created the major seismic belt in India, which extends along the Himalayas and turns south west, culminating in the Ranns of Kutch. (3) The land mass which replaced the eastern end of the Tethys Sea formed a depression between the high-rising Himalayas and the Deccan plateau. This depression was filled up by alluvial soil, brought down by the Himalayan rivers—Indus, Ganga and Brahmaputra. The fertile Indo-Gangetic plain thus came into being (See *India* infra).

The Indian sub-continent was thus formed. Dr. D.N. Wadia, a renowned Indian geologist, considered the Indian sub-continent a geological puzzle. He found it difficult to explain how three different crust blocks—the Himalayas, the Indo-Gangetic plain and the Deccan plateau—became welded into the geographical entity called India (see *The Country*, Part IV). Plate Tectonics has resolved this puzzle. The Indian sub-continent is a natural consequence of two converging plates.

7
Pre-drift Drifts

The break up assumed by the continental drift theory was apparently not the first break up. There must have been previous conjunctions of land and seas and previous break ups in what are now called the **Pre-drift Drifts**. *Tuzo Wilson, an American geologist thinks that the present Atlantic which opened up about 200 million years ago was not the first Atlantic. It was preceded by another Atlantic which closed up between 450 and 350 million years ago. When the previous Atlantic disappeared in the pre-drift drift, a collision of two plates rumpled and uplifted the long parallel ranges of the Appalachians in N. America. At that time, Ireland and N. Scotland formed part of N. America and were attached to Newfoundland. Florida, which now lies in N. America, then lay in Africa.*

Table 22
Continents

Name	*Area sq. miles*	*Percentage of Earth's area*	*Population Estimate*	*Highest Point in feet*		*Lowest Point in feet*	
Asia	16088000	29.5	2316312000	Everest	29028	Dead Sea	1302
Africa	11506000	20.0	401000000	Kilimanjaro	19340	Lake Assai	512
N. America	9390000	16.3	342700000	McKinley	20320	Death Valley	282
S. America	6795000	11.8	219000000	Aconcagua	22834	Valdes Penin	131
Europe	3745000	6.5	660313000	Elbrus	18510	Caspian Sea	92
Australia†	2968000	5.2	13800000	Kosciusko	7310	Lake Eyre	52
Antarctica	5500000	9.6	—	Vinson Massif	16860		

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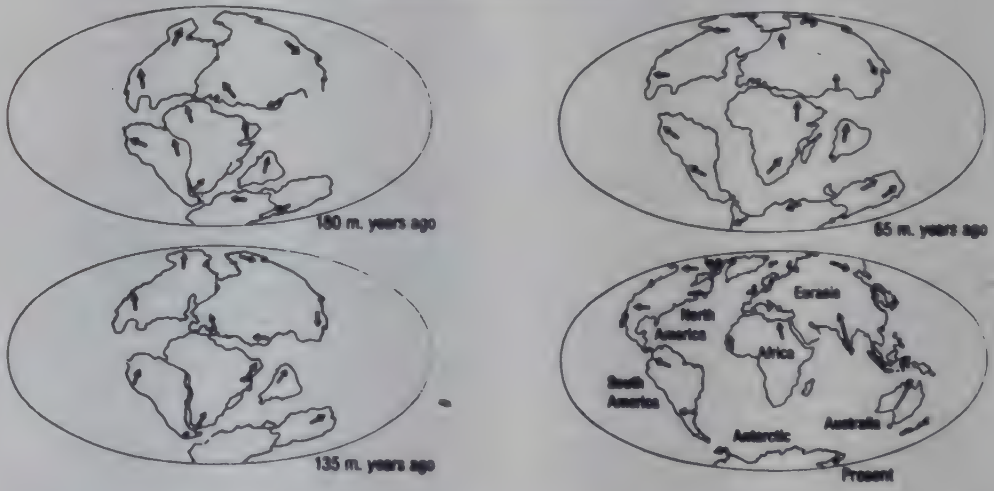
† Australia with New Zealand, Tasmania, New Guinea and the Pacific islands, (Micronesian, Melanesian and Polynesian Islands) is called *Australasia* by some geographers while others call it *Oceania*.

8
Whither Continents?



Once upon a time, say 200 million years ago, our continents were lumped together into one huge land mass called Pangaea. Then they separated and started drifting, until they have become what they are today. But they have not stopped moving even now. They continue in their age-old motions. Will they come together back again as Pangaea? No one knows. One thing, however, is certain. The configuration of Continents will be completely different in another 50 million years.

A generally accepted forecast of the shapes and positions of continents 50 million years hence is the following: Australia will push on northward to come alongside of Malaysia and collide with Asia. Such a collision will spawn earth movements more gigantic than the collision of India with Asia some fifty million years ago. Africa will continue to edge towards Europe. This will convert the Mediterranean into a series of inland lakes. The sea will invade the African Rift Valley and segregate East Africa from the mainland of Africa. The Bay of Biscay in Europe will close up. The Atlantic and the Indian Oceans will expand and the mighty Pacific will shrink. Lower California and such parts of California which lie to the west of San Andreas Fault will move towards Alaska. Los Angeles, the city of dreams, will go down the Aleutian trench and disappear into the mantle of the earth.

Source: Scala.

26. PLATE TECTONICS

The discoveries of the sixties, supporting the continental drift, have given birth to a new concept in geology—*Plate Tectonics*. Tectonics simply means the study of rock structures involved in earth movements. Plate tectonics deals with such structures as are in the form of plates. This concept has revolutionised the study of geology in the same way as the Copernican theory has revolutionised the science of astronomy. The Copernican theory entailed a radical change in our ideas of the earth and the solar system. Plate tectonics has worked a similar revolution in our conception of the earth itself. It has proved that the earth is not static but dynamic, so dynamic that it can rightly be described as 'alive and kicking'.

The Continental Drift assumed that the continents ploughed through the oceans like massive ships. Plate Tectonics tells us that it is not only the continents that are in motion, but the oceans as well. This is so, because the top crust of the earth is not (as we have thought) an unbroken shell of granite and basalt, but a mosaic of several rigid segments, called plates. These plates include not only the earth's solid upper crust, but also parts of the denser mantle below. They have an average thickness of 100 km (60 miles). They float on the plastic upper mantle of the Earth, called *Asthenosphere*, and carry the continents and oceans on their backs like mammoth rafts. All these plates are in constant motion relative to one another. One source of confusion in distinguishing between continental drift and plate tectonics is to assume that continents and plates are synonymous. They are not. Continents form only a part of the plates, the surrounding oceans form the rest of the plates. The continents alone do not drift or move. It is the plates containing both continents and oceans that move. So we now talk of *plate movements* instead of *continental drift*.

Sea floor spreading. This is a term coined by Robert S. Dietz, an American geologist to explain the mechanism of plate movements. Sea floor spreading occurs when cracks or splits open along the weak lines of plates. Rifts may open on land or sea but they develop mostly in the ocean basin, where the plates are thinnest. As the cracks open, hot magma from the interior of the earth wells up through the cracks. It cools and solidifies to form a new crust. As the plates on either side of the crack diverge, the crack widens and the new crust spreads further to cover the widening crack. Thus the ocean floor grows. When a new crust is formed it pushes the old crusts further apart. As the old crust plates are pushed, they in their turn shove their neighbouring plates which press on their neighbours and so on, round the globe. The creation of a new crust, in short, starts a chain reaction which sets the whole plate system in motion.

If the sea floor is being extended by new crusts, the surface area of the earth should also go on increasing. But through all these millions of years there has been no noticeable increase in the global surface area, even though the plates have been in constant motion. The reason is that the creation of the new crusts is set off or balanced by the destruction of the old crusts. Destruction of old plates occurs, when they bend along the deep sea trenches and plunge into the boiling mantle which destroys them completely. This means, that as new crusts are created in one place, old crusts are being destroyed in other places. This process of continuous creation and destruction keeps the top crust of the earth in a state of perpetual renewal.

PLATE MOVEMENTS

Plate movements are complex and varied. Plates may diverge, converge or move in parallels. A plate which diverges from its neighbour on one side, may converge with or slide past a neighbour on the other side. Or two parallel plates that move along a common front may diverge from or converge with other plates on other fronts. Each of these movements, however, produces specific geological reactions of its own.

Diverging plates. Plates are said to diverge, when two adjacent plates move apart. As the plates diverge, hot magma comes up through the crack and solidifies. The magma forms ridges on either side almost symmetrically. As the ridges rise, overflows from both sides spread farther and new ocean floor is created. Thus divergence brings in two results, (i) the formation of a new crust and (ii) submarine mountains or ridges. The Mid-Atlantic ridge, the East Pacific ridge and the Chagos-Laccadives ridge in the Indian Ocean and other oceanic ridges have come into being in this manner.

These oceanic ridges form a discontinuous submarine mountain chain that practically girdles the earth. Along the crests of these ridges, narrow rift valleys have opened. It is through these rift valleys that hot magma wells up to form new ocean floors. The pressure exerted by the new-formed crusts pushes the plates around.

The rifts in the ocean floor may sometimes extend into the adjoining continents and split the continent into two. This may re-align continental boundaries and create new oceans. The rift which broke Arabia away from Africa and grafted it on to Asia, changed the appearance of both continents and opened up new seas—the Red Sea and the Gulf of Aden.

Converging Plates. Plates are said to converge when they come together and collide. Such collision boundaries are known as *subduction zones*. In a subduction zone, many things happen.

(i) Melting of Old Plates. All subduction zones are marked by deep ocean trenches. The Aleutian Trench (North Pacific), the Tonga Trench (South Pacific), the Philippine Trench (West Pacific), the Peru-Chile Trench (East Pacific), the Puerto Rico Trench in the Atlantic and the Java Trench in the Indian Ocean and similar other trenches are all plate boundaries and subduction zones. Here the moving plate bends and plunges into the mantle. Such parts of the plate that go right into the mantle are melted and destroyed.

(ii) Mountain Building and Uplifting. When two continental plates converge, the lateral pressure exerted by the plates crumples and compresses them into folds. When this crumpling and folding continues, high mountains form (See *Mountains and Deserts*, infra). Continental crust is more buoyant and less dense than the mantle on which the plates rest. Therefore the plates tend to float rather than to sink. As the plates converge further, the continental crust may break off at the edges. Fresh continental plate moves in under the broken crust. This creates a double layer of low density crust which rises buoyantly to support high-rising topography.

After this, further deformation and compression may take place behind the line of collision. This will produce a high plateau like Tibet. Eventually the plate convergence itself may stop as resisting forces build up. But until such a time the converging zone will continue to breed earthquakes and volcanoes.

(iii) Earthquakes and Volcanoes. All subduction zones or plate boundaries abound in earthquakes and volcanoes. The Andean subduction zone breeds the quakes that rock Chile and Peru. The subduction zone formed by the Arabian plate and the Asiatic plate sends up the quakes that plague Iran and Turkey. Where the African and the European plates meet, the African plate has bent down into the mantle and is being steadily melted. It is this melted lava that is being thrown up by the volcanoes of Etna, Vesuvius and Stromboli in Europe.

Parallel Plates. Parallel plates, as they slide past each other along a common boundary, do not create a new crust or destroy the old. They butt and jostle against each other and produce what are called transform faults. Transform faults are fractures in rock formations. Fractures imply displacement of rocks. The displacement may range from a fraction of an inch to thousands of feet. Transform faults are not peculiar to parallel plate boundaries. All plate boundaries are characterised by transform faults. But in parallel plate boundaries this is the most important geological feature.

The San Andreas Fault in California marks the meeting place of two parallel plates, one carrying N. America and the other carrying the Pacific Ocean. This fracture stretches for more than 700 miles. It splits California in the middle at one end and cuts into the Pacific basin at the other. Both plates are moving northwest but the Pacific plate is moving faster than the American plate. For most of the time, the two plates move smoothly along but now and then their edges get locked. As the plates continue to move, the locked rocks bend and strain till they snap. Then they shift violently back to equilibrium, like a bent stick breaking. This violent shift causes earthquakes. In 1906, the San Andreas Fault shifted as much as 20 feet, unleashing the earthquake that wiped out San Fransisco.

27. EARTHQUAKES

Earthquakes are of two kinds, *Volcanic* and *Tectonic*. Volcanic earthquakes are caused by the eruption of volcanoes. On land, they are localised around the volcanoes and therefore do not cause extensive damage. But, in the sea, these earthquakes can give rise to tidal waves, which travel across the oceans and destroy shorelines far away (See *Tidal Waves* infra). Tectonic earthquakes are caused by shifts in the rock structure of the earth. They affect vast areas and cause extensive damage. When large basins of rock structures are subjected to stress, they bend as far as their elasticity would permit. Beyond this point, they break with a rebound. This causes earthquakes.

Earthquakes occur in regions of marked instability of the earth's crust. It is now known that plate boundaries form such unstable regions. Earthquakes may arise for a variety of reasons. Some tensional earthquakes clearly arise from 'faulting', that is to say, from Transform faults which are found all along plate boundaries. Some others arise from the arching of the lithospheric crust as converging plates press hard against each other. Others may result from the tearing of the lithosphere under high pressure. In short, earthquakes abound wherever the edges of two rigid lithospheric plates meet and jostle each other. Many of the earth's greatest earthquakes like the Kamchatka earthquake of 1952, the Chile earthquake of 1960 or the Alaska earthquake of 1964 occurred around such zones of high friction. Smaller zones of lesser friction produce minor earthquakes.

Seismic Belts. Such regions of the earth as are prone to earthquakes are called Seismic Belts. The circum-Pacific seismic belt, otherwise called the *Ring of Fire*, is the most important seismic belt and includes the western coast of the Americas, the eastern coast of Asia, the islands of the South-East Pacific and New Zealand. The next important belt called the *Alpine belt* runs from the South Pacific islands, through Java, Sumatra and other Indonesian islands, crosses the Central Asian mountains and passes on through Caucasus to Greece, Italy and Spain. A third belt—the *Atlantic belt*—runs from north to south through the middle of the Atlantic Ocean.

India. In India, the main earthquake belt runs along the Himalayan Ranges and southwest to the swamps of the Ranns of Kutch. All the major earthquakes of India except the one at Koyna (Maharashtra) have occurred in this belt.

Seismic Waves. When an earthquake strikes, tremors spread outwards in two different types of seismic waves. Primary or P-waves cause any rock in their path to compress and then expand in the same direction as the waves are travelling. Secondary or S-waves move the rocks in a direction perpendicular to their path.

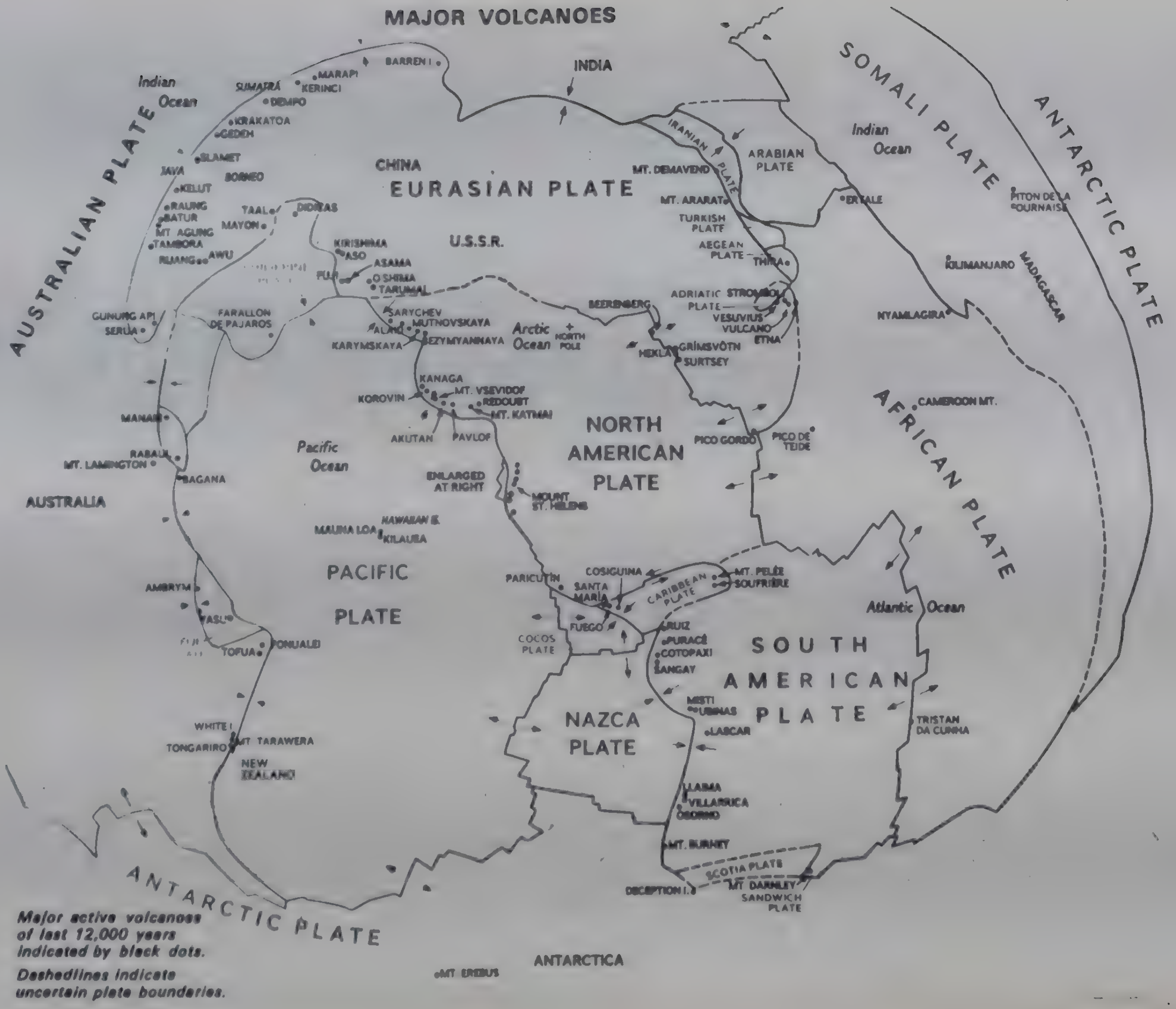
9
Seismic Waves

R. D. Oldham who was the Director General of the Geological Survey of India in 1897 was the first geologist to distinguish different seismic waves and interpret them. Oldham distinguished three main types of waves- (i) P waves or primary waves. (ii). S waves or secondary waves and (iii) Surface waves.

P waves are compression or expansion waves like those of sound, S waves vibrate at right angles to the direction of travel as 'light waves' do and Surface waves appear in the upper 20 miles or so near the earth's surface. P waves travel at their maximum speed (8½ miles per second) at a depth of 1800 miles and at about 3 miles per second in rocks near the surface of the earth. S waves travel at about two-thirds of the speed of P waves. But there is one distinction. S waves travel through the solid parts of the earth only while P waves travel through the solid as well as other parts of the earth. The speed of both varies with depths in the earth. At the core of the earth S waves disappear but P waves go on curving upwards to the surface.

According to UNESCO some 60,000 earthquakes occur annually on earth. The great majority of these earthquakes are mild and cause only tremors. Others may cause destruction in varying degrees. The magnitude of an earthquake is measured on the Richter scale, devised by C. F. Richter in 1936. Earthquakes up to 6 on the Richter

MAJOR VOLCANOES



Major active volcanoes of last 12,000 years indicated by black dots.

Dashedlines indicate uncertain plate boundaries.

scale are mild affairs and do not cause serious damages. Between 6 and 8 the earthquakes can be disastrous, depending upon what part of the world is affected by it. If it is a thickly populated area, heavy loss in life and property will follow. Beyond 8, the earthquakes are cataclysmic and bring in total destruction wherever they strike. It is estimated that over 1.5 million people have died in earthquakes, since 1000 A. D.

The table below shows the names of countries, most frequently menaced by earthquakes and the years in which notable earthquakes have occurred in each.

Table 23
Earthquakes

Country	*Years*
China	1057, 1290, 1556, 1920, 1932, 1964, 1975.
Japan	1293, 1528, 1703, 1923, 1946, 1948.
India	1737 (Calcutta), 1819 (Cutch), 1819 (Assam), 1897 (Assam), 1905 (Kangra), 1916 (Nepal), 1934 (Bihar), 1935 (Assam), 1935 (Quetta), 1937 (Calcutta), 1950 (Assam), 1967 (Koyna), 1975 (Himachal Pradesh).
Iran	1775, 1957, 1962, 1963, 1968, 1978, 1981.
Turkey	1268, 1822, 1939, 1946, 1953, 1971.
Chile	1906, 1939, 1960, 1965.
Peru	1868, 1970.
Ecuador	1797, 1868, 1949.
USA	1811-12, 1906, 1964.
Italy	1693, 1783, 1908, 1915.
Portugal	1531, 1775.

28· VOLCANOES

We now know that volcanoes and earthquakes are associated with plate boundaries, especially subduction zones. Subduction zones are centres of great activity and high pressures. Some of the historic volcanic eruptions have been found to be directly related to activities on plate boundaries. *Krakatoa*, an Indonesian island lay on a plate boundary in Sunda Strait, along the Java Trench. In 1883, this island sank and disappeared owing to volcanic eruption. In 1929 a new island—Ana Krakatoa—rose in the same place.

In 1963, a volcanic eruption rising from the Mid-Atlantic ridge, a plate boundary, created an island off the coast of Iceland—*Surtsey*. The force of the eruption sent up the lava above the water surface, forming an island, where there was none before. Volcanoes thus play a vital role in forming and transforming the topography of the earth.

It is not known exactly what forces create volcanoes or provide them the fuel power. The prevailing view is that volcanoes are fired by thermal plumes or hot spots which send up molten lava under high pressure. Such thermal plumes or hot spots are found distributed over the globe. They break out periodically. A thermal plume in the Pacific has been turning out volcanoes for some 70 million years. This plume has built a 1500-mile chain of volcanoes, over the Hawaiian archipelago, extending from Hawaii at one end to Midway on the other. Another chain of submerged volcanoes, over 2000 miles long, called the *Emperor Sea Mounts*, has also been attributed to this plume. Both these chains have been built by the movement of the Pacific plate. As the Pacific plate moved over the plume, at about 5 inches per year, the upwelling from the plume created a steady succession of volcanoes. As the Pacific plate moved on, these volcanoes migrated with it.

Active Volcanoes. There are about 535 active volcanoes out of which nearly 80 are in the oceans. Volcanoes are said to be *active* when eruptions occur frequently, *dormant* when no eruption has occurred over a long period of years and *extinct* when no eruptions have occurred during historic times.

Aconcagua (22,834 feet), the highest peak in the Andes, South America, is an extinct volcano, *Kilimanjaro* (19,565 ft.) in Tanzania, Africa and *Llullaillaco* (22,057 ft.) in Chile, South America are thought to be dormant. But volcanoes keep surprises up their sleeve, so to say. *Vesuvius*, for instance, was thought to be extinct but it sprang into unexpected activity in 1944.

Volcanoes that have erupted since 1956 and those that are steaming or rumbling are given in the table below.

Table 24

Height (feet)	*Name & Location*	*Date of Last Notified Eruption*
19,347	Cotopaxi–Andes, Ecuador	Steams
17,887	Popocatepetl–Altiplano de Mexico (Mexico)	Steams
15,584	Klyvuchevskaya-Sredinny Khrebet (Kamchatka Peninsula) USSR	1964
14,006	Wrangell–Wrangell Mts., Alaska	Steams
13,812	Tajumulco–Guatemala	Rumbles
12,582	Fuego–Sierra Madre, Guatemala	1962
12,450	Erebus–Ross Is. Antarctica	Steams
12,224	Rindjani-Lombok, Indonesia	1964
12,060	Semeru–Java, Indonesia	1963
11,057	Mt. Etna–Sicily, Italy	1965
10,308	Agung–Bali, Indonesia	1964
8364	Mt. St. Helens, USA	1980
6760	The Peak-Tristan da Cunha, S. Atlantic	1961
4090	Kilauea–Hawaii	1961
3031	Stromboli-Island, Mediterranean	1956
568	Surtsey†–off S. E. Iceland, Iceland	1963
510	Ana† (New) Krakatoa-Island, Indonesia	1929

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† Both are volcanic islands formed in the present century—Surtsey in 1963 and Ana Krakatoa in 1929.
See map p. 114.

29. MOUNTAINS & DESERTS

Mountains are conventionally divided into four types, according to their mode of origin: Fold mountains, Block mountains, Volcanic Mountains and Residual Mountains.

Fold Mountains arise because the rocks in them have been buckled and crumpled by pressure. Just as a tablecloth, when pushed along a table, wrinkles up into folds, the rocks of the earth's crust react to lateral pressure to form folds. If the pressure is very great, the folds are squeezed tightly into pleats. Further pressure will send the pleats rolling over one another. As the pleats roll up, high elevations are formed. Only massive pressures like those resulting from colliding plates can fold and mould rocks into mountains. In fact, it turns out that all our big mountain systems have been formed by colliding plates. The *Himalayas* rose over such a colliding zone. So did the *Andes* (S. America), the *Rockies* (N. America) and the *Alps* (Europe). The Himalayas, the Andes, the Rockies and the Alps are fairly young mountains and are classed as *new fold mountains*. They have come into being, after the continental drift started with the break-up of the supercontinent, Pangaea (See *Continental Drift)*.

What are called *old fold mountains* must have been formed in the Pre-drift era long before the continental masses came together to form Pangaea. Among the old fold mountains are the *Pennines* of Europe, the *Appalachians* of America and the *Aravallis* of India. These mountains had been weathered down to stumps long ago (see *Pre-drift Drift* supra).

Table 25
Principal Mountain Peaks

Name	*Country*	*Height (ft)*
Mt. Everest	Nepal-Tibet	29,028
Mt. Godwin Austen (K 2)	India	28,250
Kanchenjunga	Nepal-India	28,280
Dhaulagiri	Nepal	26,810
Nanga Parbat	India	26,660
Annapurna	Nepal	26,504
Nanda Devi	India	25,645
Mt. Kamet	India	25,447
Gurla Mandhata	Tibet	25,355
Tirich Mir	Pakistan	25,263
Minya Konka	China	24,900
Mt. Communism	USSR	24,590
Pobeda Peak	USSR	24,406
Muztagh Ata	China	24,388
Chomo Lhari	India-Tibet	23,297
Muztagh	China	23,890
Aconcagua	Argentina	22,834
Ojos del Salado	Argentina-Chile	22,532
Cerro Mercedario	Argentina	22,221
Huascaran	Peru	22,205
Llullaillaco	Chile	22,057
Volano		
Tupungato	Chile-Argentina	21,489
Sajama Volcano	Bolivia	21,391
Illampu	Bolivia	21,276
Vilcanota	Peru	20,664
Chimborazo	Ecuador	20,561
Mt. McKinley	Alaska	20,320

Block Mountains come into being as a result of vertical earth movements along cracks or faults. Such movements are also caused by the pressure generated by plates. When such vertical earth movements leave a block of high elevation standing between two areas of low elevation, the high land area forms a block mountain. Block mountains are usually steep-sided. The *Vosges* in France and the *Black Forest* mountains in W. Germany are mountains of this type.

Volcanic Mountains form as a result of volcanic eruptions. When a volcano erupts, the materials that are ejected fall around a hole or crater and build up a mountain that is roughly conical in shape and has a crater at the top. *Fujiyama* in Japan, *Vesuvius* in Italy and the *Chimborazo* and *Cotopaxi* in the Andes (S.America) are examples of such mountains.

Residual Mountains. Some mountains are so deeply dissected and reduced by weathering and river action that they stand out as skeletons. The *Catskill* mountains of New York are typical of this class.

Table 26
Great Deserts

Name	*Country*	*Area in sq. miles*
Sahara	N. Africa	3,500,000
Libyan	N. Africa	650,000
Australian	Australia	600,000
Great Victoria	Australia	125,000
Syrian	Arabia	125,000
Arabian	Arabia	50,000
Gobi	Mongolia	400,000
Rub'al Khali	Arabia	250,000
Kalahari	Botswana	200,000
Great Sandy	Australia	160,000
Takla Makan	China	125,000
Arunta	Australia	120,000
Kara Kum	S. W. Turkistan	105,000
Nubian	N. Africa	100,000
Thar	N. W. India	100,000
Kizil Kum	Central Turkistan	90,000

30. ISLANDS

Islands comprise a large mass of land, the biggest 16 of them accounting for as much as 22 million sq. miles—greater than the area of the continent of Europe. The smaller islands count by the thousands. Islands are broadly divided into three types, continental, oceanic and coral. *Continental Islands* are those islands that rise from the continental shelf, like the British Isles or Newfoundland. These islands have the same geological structure, as the continents to which they are related. *Oceanic Islands* are those that rise from the bosom of the oceans. Their geological structure will have no relation to that of the nearest shores. They are very often the tops of submarine mountains or submarine volcanoes. *Ascension* and *Tristan da Cunha*, for example, rise from the Central Atlantic ridge (mountain) while *St. Helena* and *Teneriffe* are islands formed by submarine volcanoes.

Coral Islands are the work of minute sea organisms called coral polyps. They congregate in large colonies. When the organisms die, their skeletons, which are made of a substance resembling limestone, form big clusters, some of which rise above the water.

Coral organisms are of many types and coral formations assume many strange shapes. Some colonies spread out like fans, others grow into umbrella-like discs or plates, while many develop spiky horns. Their colours are also as varied as their shapes. Most corals are of different pastel hues, such as lavender, soft blue, green or violet. Coral retains its fascinating colours when the colony is alive. When the colony dies, the colours fade gradually, and totally disappear where the coral is exposed to the heat of the sun.

The gem varieties of coral which have been found in red, pink, gold or black colours do not bleach or change colour when exposed to the sun (see *Gemstones*, Part II).

Reef Corals. One type of coral excels in building reefs. Reef-building corals thrive in warm tropical seas. They usually start building reefs, along the edges of islands. Such reefs are called *fringing reefs*. Many tropical islands have such fringes. These protect the islands from the ravages of the sea. Sometimes an island, with a coral fringe begins to sink. Its shoreline goes down first, while coral building continues upwards. The sea invades the sinking shoreline and separates the coral reef from the rest of the island. Such a reef is called a *barrier reef*. The *Great Barrier Reef*, which extends for more than 1200 miles parallel with the coast of Queensland, Australia, appears to have come into existence in this manner. This is the biggest coral reef known and consists almost entirely of the limestone skeletons of countless coral colonies that had existed through thousands of years. (See *Superlatives Part II*).

Atolls. Low circular coral islands, each with a central lagoon of shallow water, are called atolls. Atolls probably represent the late stage in the evolution of a coral island. When the island around which coral builds sinks, the coral ring remains above water, while the island disappears under the water. In course of time the coral limestone reef is weathered down to soil and seeds carried by birds or winds begin to sprout and produce vegetation. Then the coral reef turns into an inhabitable area—*a coral island* in fact.

Atolls consist of two parts, a central lagoon (watery area) and a surrounding reefland. Sometimes the watery surface is much bigger than the land surface. This is the case with *Kwajelin* in Marshall Islands, Central Pacific, where the water area covers 1100 sq. miles while the land area is a narrow ring, with a total length of 176 miles. On the other hand, *Christmas Island* in Line Islands, Central Pacific, is an atoll with the largest land area known—184 sq. miles. Its lagoon or water surface is relatively insignificant.

Table 27

World's Largest Islands

Name	*Area sq. miles*	*Location*
Greenland	840000	Arctic Ocean
New Guinea	317000	West Pacific
Borneo	287400	Indian Ocean
Madagascar (Malagasy Rep.)	227800	Indian Ocean
Baffin Island	183810	Arctic Ocean
Sumatra	182860	Indian Ocean
Honshu	88019	N.W. Pacific
Great Britain	84186	North Atlantic
Ellesmere Island	82119	Arctic Ocean
Victoria Island	81930	Arctic Ocean
Celebes	72987	Indian Ocean
South Island, New Zealand	58093	S. W. Pacific
Java	48763	Indian Ocean
Luzon	46636	West Pacific
North Island, New Zealand	44281	S. W. Pacific
Newfoundland	42734	North Atlantic
Cuba	41634	Caribbean Sea
Iceland	39698	North Atlantic
Mindanao	39191	West Pacific
Ireland (Northern Ireland and the Rep. of Ireland)	31839	North Atlantic
Hokkaido	30007	N. W. Pacific
Hispaniola (Dominican Rep. & Haiti)	29530	Caribbean Sea
Sakhalin	28597	N. W. Pacific
Tasmania	26215	S. W. Pacific
Sri Lanka	25332	Indian Ocean

31. HYDROSPHERE

It is estimated that the hydrosphere contains about 1,460,000,000 cubic km of water. Of this 97.3% is in the oceans and inland seas. The rest 2.7% is found as glaciers and ice caps, fresh water lakes, rivers and underground water. The distribution of fresh water among the different sources are indicated below:

Table 28

Fresh Water Resources

Source	*Area (km^2) × 10^3*	*Volume(km^3) × 10^3*	*Percentage of total*
Total fresh water	147900	38982	2.67
Polar ice and glaciers	15100	29784	2.04
Ground water 800 m - 4000 m deep	130900	4964	0.34
Less than 800 m deep	130900	3842	0.27
Lakes	830	131.4	0.009
Soil moisture	130900	73	0.005
Atmospheric vapour	510100	14.6	0.001
Rivers	—	1.5	0.0001

Source: Science Reporter, Mar-Apr. 1981.

The total stock of ocean water and fresh water has been fairly constant throughout geological history. But the ratio between ocean water and fresh water has always changed according to climatic conditions. When the climate is very cold much of the sea water is absorbed by glaciers and ice caps and fresh water increases at the expense of sea water. When the climate grows hot glaciers and ice caps melt and sea water gains at the cost of fresh water. "Sea level observations during the last 60 to 80 years indicate that the sea level is rising slowly."† This means that the climate is becoming hotter.

Oceanic Waters. The oceans cover 70.8% of the earth's total surface area and hold 1445 million cubic km of water. The water despite its abundance is not directly useful to man, because it is not potable.

The ocean water contains about 3.5 per cent of dissolved salts—chlorine, sodium, magnesium, sulphur, calcium, potassium, bromine, strontium and boron. Minute quantities of carbon, silicon, aluminium, flourine and iodine are also found. The oceanic waters are always in motion, owing to a variety of natural forces.

(i) Tides. Tides are caused by the gravitational pulls of the sun and the moon. The sun's influence on the tides is less than half that of the moon, because the sun is so far away. All the same, the sun countervails and supports the moon's pull alternately. When the sun, moon and earth are in a line as at new and full moon, the sun and moon combine their powers and we have very high tides called *spring tides*. When the sun and the moon are at right angles, as in the moon's first and third quarters, the sun acts as a counter-balancing force and reduces the moon's pull. During these periods, we experience very low tides called *neap tides*.

(ii) Coriolis Effect. Solar heat sets ocean water moving. The sun warms up the water in the equatorial regions causing it to expand and rise by a few inches. This extra rise in the equator causes the water to flow down, to the north and south poles. As the warm water of the Equator flows north and south, the heavier cold water (heavier, because of its extreme condensation) in the polar areas sinks below the warm water and spreads slowly along the bottom to the equatorial regions. This interflow is complicated by the force of the rotation of the earth. Because the earth spins eastwards, the sea water tends to roll up to the west, turning slightly to the right in the northern hemisphere, and to the left in the southern hemisphere. This is known as the *Coriolis Effect*, after the French mathematician, who discovered it nearly a century ago.

(iii) Oceanic Eddies. Then there is the force of winds. The trade winds, which form a regular feature of the tropical regions, blow diagonally towards the Equator from the east in both hemispheres and then turn about and blow eastwards. Thus they keep pushing the ocean waters from the east to the west and then circling them back. This causes the huge *oceanic eddies* of whirling waters on the surface of the ocean.

(iv) Ocean Currents. The surface currents of the oceans are known as ocean currents. They not only help navigation but also influence the climate of the adjoining lands and determine fishing grounds. (1) The *Gulf Stream* is the earliest ocean current to be noticed and charted. It flows from the Gulf of Mexico into the Atlantic ocean, as a warm and swift current. It follows the American east coast up to Newfoundland. The icy ***Labrador current*** from the Arctic joins the warm Gulf stream near Newfoundland. The warm Gulf Stream melts down thousands of icebergs carried by the Labrador current. This causes billowing banks of fog. Half way to Europe, the Gulf stream splits into two branches. (2) *Kuroshio Current*. This current skirts Taiwan and the islands of Japan, goes along the coasts of British Columbia, Washington and Oregon. It is a warm but slow drifting current. (3) *Humboldt Current*. This is a cold current that runs along the west coast of America. This current carries with it, plenty of fish-feed and nourishes one of the richest populations of marine life in the world. The Peruvian fishing industry thrives upon this current. It also supports millions of birds who live on fish and whose droppings on the shore *(guano)* form the basis of an extensive fertiliser industry.

Among other Ocean Currents are:—(1) *South Equatorial Current* (2) *Brazil Current* (3) *West Wind Drift* (4) *Benguela Current*—all in South Atlantic (5) *North Pacific Drift* (6) *California Current* (7) *North Equatorial Current*—all in North Pacific (8) *South Equatorial Current* and (9) *West Wind Drift*-both in South Pacific.

(v) Under Currents. Recent researches in oceanography have revealed powerful under-currents in the sea. *Cromwell current*, discovered in 1951, is a fast under-current in the Pacific. It is about 3500 miles long and almost as fast as the Gulf stream. In 1957-58, a joint British—American oceanic team discovered a great current under the Gulf Stream, between a depth of 6000 and 10,000 ft, which was flowing in the opposite direction to the Gulf Stream. These deep under-currents are still being investigated.

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† Science Reporter March-April 1981.

(vi) Tidal Waves. Tidal waves are a misnomer because these waves have little to do with tides. They are caused by extra-tidal forces, mainly by submarine volcanoes and earthquakes and sometimes by hurricanes or cyclones. The Japanese call them *Tsunami*.

They flash through the open seas at the fantastic speed of 400 miles or more per hour. The waves follow one another in a stream with an interval of some 15 minutes between them. They appear so low and harmless in the open seas that they often deceive the sailors. When the waves are near the shore, however, they rise up to 40–50 ft and even to 100 ft in bays and inlets, battering down trees and houses in a few minutes. These waves travel very long distances and cause untold misery and loss, far away from their original starting points. The wave that hit Japan in 1960 was started by earthquakes off the coast of Chile.

Demarcation of the Oceans. The oceans, unlike the continents, merge so naturally into one another that it is hard to demarcate them. Nevertheless, geographers have divided the oceanic area into 4 oceans, namely, the *Pacific*, the *Atlantic*, the *Indian* and the *Arctic*. These oceans, by definition, include the seas, bays gulfs and other ocean inlets attached to them. The *Pacific* ocean is the largest and the oldest of the oceans. It occupies 35.25 per cent of the world area. It is 10492 miles at its broadest and 37,782 feet at its deepest (Mindanao Deep). It has the greatest conglomeration of islands, which fall into three broad groups, *Micronesia*, *Melanesia* and *Polynesia*. The *Atlantic* ocean, the second largest ocean, covers 20.9 per cent of the world area. Its greatest depth is 27,498 feet (Milwaukee Deep). The *Indian* ocean, the third largest, stretches from Cape Comorin in India to the Antarctic at the South Pole. It takes up 14.65 per cent of the earth's total surface area. Its greatest depth is 25,344 feet (Planet Deep). The *Arctic* is strictly not an ocean. It is not navigable. It winds round the North Pole and is completely frozen in winter and covered with drifting ice for the rest of the year. However, its separate existence and its area of over 5 million sq. miles entitle it to be called an ocean.

Seven Seas. We have got only four oceans but seven seas. The proverbial seven seas are made up by dividing the first three oceans into north and south along the Equator and adding Arctic to them, thus: North Pacific, South Pacific, North Atlantic, South Atlantic, North Indian, South Indian and Arctic.

The following table shows the areas of the oceans, with their seas and other inlets detached.

Table 29
Oceans

Name	*Area (sq. miles)*
Pacific	63,800,000
Atlantic	31,800,000
Indian	28,400,000
Arctic	5,400,000

The following table shows the areas of principal seas.

Table 30
Principal Seas

Name	*Area (sq. miles)*
South China Sea ..	3,144,000
Caribbean Sea ..	1,063,000
Mediterranean Sea ..	966,750
Bering Sea ..	875,750
Gulf of Mexico ..	595,750
Sea of Okhotsk ..	589,800
East China Sea ..	482,300
Hudson Bay ..	475,800
Sea of Japan ..	389,000
Andaman Sea ..	308,000
North Sea ..	222,125
Black Sea ..	178,375
Red Sea ..	169,000
Baltic Sea ..	163,000
Persian Gulf ..	92,200
Gulf of St. Lawrence ..	91,800

32. OCEAN FLOOR

It was once thought that the sea bottom was flat and featureless. Recent researches in oceanography have revealed amazing topographical features in the ocean bed. The sea basins, some two and a half miles down are furrowed with terraces ribbed with mountain ranges and pitted with deep trenches.

The ocean floor may be subdivided into 3 broad groups: i. the Continental Terrace, ii. Abyssal Plains and iii. Ocean Trenches. The ocean floor slopes down from the Continental Shelf to the deep sea plains. *The Continental Shelf* is the sea floor closest to the shore. The shelf slopes down to a depth of around 200 m. The average width of the continental shelf may be between 65 and 75 km but in some places the width may be as much as 800 miles. The total area of the continental shelf is big, as big as that of Europe and S. America put together, that is to say, around 10 million sq. miles.

Beyond the shelf is the *Continental Slope* which generally reaches a depth of 1500 m but may go down to 2500 m in some places. It occupies a comparatively narrow strip of the sea-bed with an average slope of 4.3 degrees. The next portion which is really a part of the Slope is called the *Continental Rise*. This has a fairly wide extent of 1500 to 3000 m sometimes going up to 4000 m. Both the Slope and the Rise are covered up with sedimentary matter which has floated down from the continent and its shelf. But the Slope is only partly covered with sediments while the Rise is almost wholly covered with it. These three different parts—Continental Shelf, Slope and Rise—are often clubbed together as the *Continental Terrace*.

Beyond the Continental Terrace lie the deep sea plains called *Abyssal Plain* which may average a depth of some 4000 m going down in some areas to as much as 6000 m. According to one estimate, the Continental Shelf forms about 9 per cent, the Continental Slope (including the Continental Rise) about 12 per cent and the Abyssal Plains about 79 per cent of the sea floor.

10

MONEX

Monex (Monsoon Experiment) was initiated by the World Meteorological Organisation (WMO) under the aegis of the UN, with the assistance of 50 countries. It is a global study in as much as the massive air movements from the southern to the northern hemisphere which the monsoon winds generate have far-reaching consequences to the whole world. No doubt the monsoon countries form the focal points of study, since as terminal countries they provide the best starting points to trace back the monsoon to its original source. Monex is planned in three phases. The first phase was in Saudi Arabia and included the study of the amount of heat added to the air which accelerates the driving force of the monsoon. The second phase is the study of the winter and summer monsoons. The last phase is the collection of data from the Bay of Bengal with special emphasis on the causes and nature of the cyclones.

The first phase based in Saudi Arabia has been completed. The first part of the second phase, study of the winter monsoon was carried out from Dec. 1978 to Feb. 1979, with the base in Malaysia. It concentrated on the winter monsoon in South China Sea. Twenty countries participated including not only the lesser countries of the region but also China, the US and the USSR. The summer monsoon study was conducted from May to July 1979, with India as the base. It is supported by 30 countries including India and the neighbouring countries and the monsoon countries of Africa and, of course, the USA and the USSR.

According to Dr. Jaochim P. Kuetner, one of the Directors of the project this in-depth study of the two monsoons should add considerably to our knowledge of the subject in all its aspects, and even enable us to make predictions, in regard to its onset, the breaks in it, and so forth.

The data collected in Malaysia and India were collated at the International MONEX centre in Delhi, processed in the US and are kept in the archives in Washington and Moscow for reference.

Ocean Trenches. The Ocean Trenches are long narrow trench-like depressions many thousands of feet deep. The deepest portions of the Trenches are called *Ocean deeps*.

With the advent of plate tectonics, ocean trenches have acquired new significance. It is only now that we realise the great role played by ocean trenches in the formation and renewal of the earth's crust. Almost all ocean trenches known, form what are called *subduction zones*. Subduction zones are seats of incessant geological activity. Here, the old crust plates are being steadily destroyed, thus making way for the growth of new crust. (see *Lithosphere, Seafloor Spreading*–supra). Mountain building, earthquakes and volcanoes and other activities are also associated with subduction zones. (see *Lithosphere, Plate Movements et seq* supra).

Table 31

Major Subduction Zones

Name	*Plates involved*	*Length Km*	*Subduction Cm. per Year*	*Type of Subducting Lithosphere*
Kuriles-Kamchatka-Honshu	Pacific plate under Eurasian Plate	2800	7.5 cm.	Oceanic
Tonga-Kermadec-New Zealand	Pacific under Indian Plate	3000	8.2 ,,	,,
Middle American	Cocos plate under North American	1900	9.5 cm.	Oceanic
Mexican	Pacific plate under North American	2200	6.2 ,,	,,
Aleutian	Pacific under North American	3800	3.5 ,,	,,
Sundra-Java-Sumatra-Burma	Indian plate under Eurasian	5700	6.7 ,,	,,
South Sandwich	South American plate under Scotia	650	1.9 ,,	,,
Caribbean	South American under Caribbean plate	1350	0.5 ,,	,,
Aegean	African plate under Eurasian	1550	2.7 ,,	,,
Solomon-New Hebrides	Indian plate under Pacific	2750	8.7 ,,	,,
Izu-Bonin-Marianas	Pacific plate under Philippine	4450	1.2 ,,	,,
Iran	Arabian plate under Eurasian	2250	4.7 ,,	Continental
Himalayas	Indian plate under Eurasian	2400	5.5 ,,	,,
Ryukyu-Philippines	Philippine plate under Eurasian	4750	6.7 ,,	Oceanic
Peru-Chile	Nazca plate under South American	6700	9.3 ,,	Oceanic

33. RIVERS, LAKES & WATERFALLS

Rivers, lakes and waterfalls form part of the hydrosphere, even though they are usually treated as land or lithospheric features.

The Longest Rivers. "The two longest rivers in the world are the Amazon (Amazonas) flowing into the South Atlantic and the Nile (Bahr-el-Nil) flowing into the Mediterranean. Which is the longer is more a matter of definition than simple measurement" (Guinness Book of World Records 1980 edn.).

The length of the Amazon as measured in 1969 is 4007 miles (6448 km). A subsequent calculation has placed it at 4195 miles (6750 km). The length of the Nile as measured by M. Devroey of Belgium is 4145 miles (6670 km). If we take the lower figure for Amazon (4007 miles) the Nile leads by 38 miles. If the higher length is considered (4195 miles) the Amazon leads the Nile by 50 miles.

The Biggest River. However, in judging rivers, the primary criteria are the amount of water they carry and the extent of the area they serve whether for navigation or cultivation. On these counts the Nile loses to the Amazon by wide margins. The Amazon has the longest stretch of navigable water, 2300 miles. It has the greatest flow of all rivers in the world with an average 4,200,000 cubic feet of water per second (cusecs) rising up to 7,000,000 cusecs in flood. It has the largest river basin in the world 2,720,000 sq. miles. It has some 15,000 tributaries, the longest tributary Madeira having a length of 2000 miles.

Table 32
Longest Rivers

Name	*Country/ Continent*	*Length in miles*
Amazon	S. America	4007/4195
Nile	Africa	4145
Mississippi-Missouri	USA	3710
Yangtze	China	3400
Ob-Irtysh	USSR	3200
Congo	Africa	2900
Amur	Asia	2704
Hwang (Yellow)	China	2700
Lena	USSR	2648
Mackenzie	Canada	2635
Mekong	Asia	2600
Niger	Africa	2600
Parana	S. America	2450
Yenisey	USSR	2364
Murray-Darling	Australia	2310
Volga	USSR	2290
Madeira	S. America	2000
Yukon	Alaska-Canada	1979
St. Lawrence	Canada-USA	1900
Rio Grande	USA-Mexico	1885
Purus	S. America	1850
Sao Francisco	S. America	1800
Salween	Asia	1750
Danube	Europe	1725
Euphrates	Asia	1700
Indus	Asia	1700
Tocantins	S. America	1700
Brahmaputra	Asia	1680
Syr-Darya	USSR	1680
Si	China	1650
Ganga	India	1650
Orinoco	S. America	1600
Nelson	Canada	1600
Zambezi	Africa	1600
Ural	USSR	1574
Amu-Dar'ya	USSR	1550
Olenek	USSR	1500
Paraguay	S. America	1500
Japura	S. America	1500
Arkansas	USA	1450
Colorado	USA-Mexico	1450
Dnieper	USSR	1418
Rio Negro	S. America	1400
Orange	Africa	1350
Kolyma	USSR	1335
Irrawaddy	Burma	1325
Ohio	USA	1306
Kama	USSR	1262
Don	USSR	1222
Columbia	USA-Canada	1214
Saskatchewan	Canada	1205
Peace	Canada	1195
Darling	Australia	1160
Angara	USSR	1157
Tigris	Asia	1150
Sungari	Asia	1130
Pechora	USSR	1111
Snake	USA	1038
Red Texas	USA	1018
Churchill	Canada	1000
Pilcomayo	S. America	1000
Uruguay	S. America	1000
Magdalena	Colombia	1000

Table 33
Principal Lakes and Inland Seas

Name	*Location-(Countries)*	*Salt or fresh*	*Area in sq. miles*
Caspian Sea	USSR & Iran	Salt	143550
Lake Superior	US & Canada	Fresh	31820
Victoria Nyanza	Uganda, Tanzania & Kenya	Fresh	26828
Sea of Aral	USSR	Salt	25300
Lake Huron	Canada & US	Fresh	23010
Michigan	US	,,	22400
Tanganyika	Zaire, Tanzania & Zambia	,,	12700
Great Bear	Canada	,,	12275
Baikal	USSR	,,	11780
Nyasa (Malawi)	Tanzania, Malawi & Mozambique	,,	11430
Great Slave	Canada	,,	10980
Erie	Canada & US	,,	9930
Winnipeg	Canada	,,	9464
Ontario	Canada & US	,,	7520

Ladoga	USSR	Fresh	6835
Chad	Niger, Nigeria, Chad & Cameron	,,	6300
Onega	USSR	,,	‡3710
Eyre	Australia	,,	‡3700
Titicaca	Peru & Bolivia	,,	3200
Athbaska	Canada	,,	3120
Nicaragua	Nicaragua	,,	3089
Rudolf	Kenya & Ethiopia	,,	2475
Reindeer	Canada	,,	2465
Issyk Kul	USSR	,,	2355
Torrens	Australia	,,	2230
Vanern	Sweden	,,	2149
Winnipegosis	Canada	,,	2105
Albert	Uganda & Zaire	,,	2075
Kariba	Zimbabwe & Zambia	,,	2050

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‡ The area is highly variable according to seasons. The figure given is the average area.

Table 34

Famous Waterfalls (by height)

Name	*Country*	*Height(ft.)*
Angel	Venezuela	2648
Kukenaam	Venezuela	2000
Ribbon	USA	1612
King George VI	Guyana	1600
Upper Yosemite	USA	1430
Tugela	S. Africa	1350
Gavarnie	France	1385
Wollomombi	Australia	1100
Takakkaw	Canada	1000

(By volume of water)

		Average annual flow (cu. ft. sec.)
Guaria	Brazil	470000
Khon	Indo-China	410000
Niagara	Canada	212200
Paulo Afonso	Brazil	100000
Urubupunga	Brazil	97000
Iguazu	Argentina	61660
Patos-Maribondo	Brazil	53000
Victoria	Zimbabwe	38430
Grand	Labrador	35000
Kaieteur	Guyana	23400

34. ATMOSPHERE

The atmosphere is an insulating blanket protecting the Earth. It softens the intense light and heat of the Sun. Its ozonic (O_3) layer absorbs the most deleterious wave lengths of the sun's ultraviolet rays and thus protects living organisms from extinction. The atmosphere is bound to the earth by gravity. Satellites like the moon, who have very low gravitational power, cannot and do not hold an atmosphere.

Air Pressure. Air pressure simply means the weight of the entire air column over a given point. Air, of course, has very little weight. A cubic foot of air weighs around an ounce and a quarter. At the sea level, the air pressure is 14.7 pounds to the sq. inch. This pressure is usually described as *one atmosphere* (see diagram p. 125).

Composition. The atmosphere is composed of various gases and water vapour, and in its uppermost reaches, it is charged with subatomic particles. Up to about 30 miles from the earth, the atmosphere consists of about 78 per cent nitrogen, 21 per cent oxygen (O_2) and minor percentages of argon, carbon dioxide, neon, helium and methane, in that order. Above 30 miles, the atmosphere is made up of atomic oxygen (O_1), ozone (O_3), helium and hydrogen.

The presence of atomic hydrogen in the upper atmosphere has recently been confirmed by a camera left on the surface of the moon by the Apollo-16 mission. The camera has revealed a cloud of atomic hydrogen extending outwards from the earth to about 64000 km.†

Water vapour is present in the lower atmosphere, say up to 7 miles, in concentrations ranging from 0.01 per cent to 1 per cent. Although the amount of water vapour in the atmosphere is very small, its importance is very great, for without water in the atmosphere, there would be no weather on earth. Water enters the atmosphere by evaporation from the hydrosphere (and also by transpiration of plants) and leaves the atmosphere by precipitation as snow or rain. It is a never-ending two-way traffic.

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† Some astronomers think that the Sun's ultraviolet rays break up the water molecules in the upper atmosphere into hydrogen and oxygen atoms. The lighter hydrogen atoms stay up and the heavier oxygen atoms descend to the lower atmosphere, replenishing the oxygen supply of the earth. Thus a major part of the oxygen supply of the earth could have been contributed by the solar ultraviolet radiation, and not by photo synthesis, as believed earlier. (see *Biosphere* infra).

Clouds are made of water vapour that has evaporated from the earth. They are very tiny droplets of microscopic size and are too light to fall down as rain. So they ride on the air waves until they are condensed and then fall down as rain. Clouds are classified according to their shapes. *Cirrus* clouds are shaped like ringlets and go up to 40,000 ft. in height. *Cumulus* clouds are those that rise in heaps, and *Stratus* are those that are scattered about. *Nimbus* clouds are the menacing rainstorm clouds. The various types are often found mixed together like the *cirro-cumulus, cirro-stratus, cumulo-nimbus,* etc.

Cumulo-nimbus clouds are the homes of thunder and lightning. The top of these clouds has a positive charge while the middle and lower portions are, for the most part, negatively charged. The earth below is mainly positive. The negative layer caught between two positive layers—the earth and the cloud top—is always restive. Here lightning flickers intermittently, lighting up the cloud from within. Every now and then streaks of lightning break through the clouds and strain towards the earth.

It is the surge of electricity from the earth that makes the lightning the awesome phenomenon that it is. The lead, however, is taken by the clouds which send down a rather weak stroke called the leader stroke. The earth responds by sending up a much more massive stroke to the clouds. The whole thing takes less than a second, so that we see the leader stroke and the counter stroke as one flash of lightning.

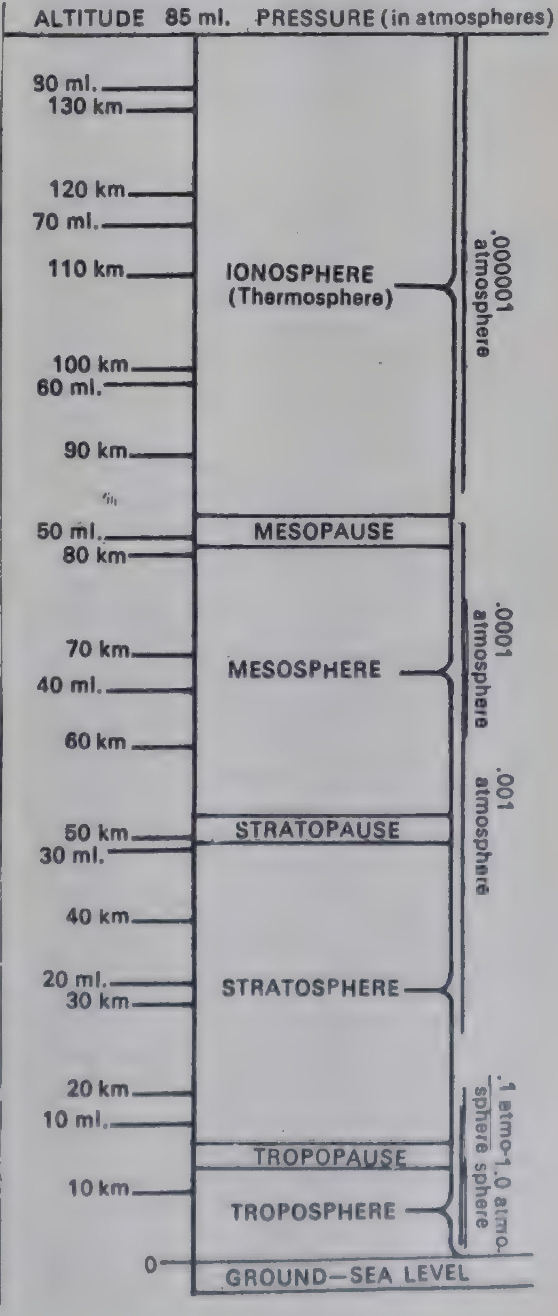
Dry air is highly resistant to electricity. When the air is loaded with water vapour it becomes an easier conductor. Nevertheless, much power is required for the stroke to rip through the air. This excessive discharge of electricity heats up the air around the passage (of the stroke) to incandescent temperatures, say 10,000° C. It is this glowing air that we see as lightning flash. The heat also causes a sudden expansion of air which, as the heat disappears, contracts quickly again. This sudden expansion and contraction produce the familiar thunder clap. Although both occur at the same time, we see the flash first because light travels much faster than sound.

It has been estimated that at any time, an average of about 1800 thunder storms take place over the globe. Lightning flashes are, of course, numberless.

Atmospheric Layers. The character and composition of the atmosphere change as we go higher and higher. Altitudinally arranged, there are 4 important spheres, with 3 pauses. They are: 1. Troposphere with Tropopause, 2. Stratosphere with Stratopause, 3. Mesosphere with Mesopause and 4. Ionosphere or Thermosphere.

Fig. 1

Divisions of the Atmosphere



The *Magnetosphere* which lies beyond the Exosphere along with *Magnetopause* which marks the outer boundary of the Magnetosphere, does not form part of the atmosphere. It represents the outermost limits of the earth.

Troposphere. This is the lowest gaseous layer of the atmosphere and extends to a height of about 7 miles from the earth. The troposphere contains nearly two-thirds of the total mass of the atmosphere. It is the region of weather and clouds. Here, the air thins out with increasing altitude and temperatures drop at an average of 2°C for every 1,000 feet. The familiar saying 'the higher we go, the cooler it is' applies to this region.

Tropopause. This is the layer that joins troposphere, the lowest layer, with the upper layer Stratosphere. The height of tropopause varies with latitude. It is the highest at the Equator, where it is located at 18 km above the earth. At the poles, it is about 6 km above the earth. In India, the tropopause is generally at a height of around 16 km.

In the tropopause, temperature levels out at the lowest point reached in the troposphere. The tops of cumulus-nimbus clouds often float in this region.

Stratosphere. This is the region above tropopause. It is about 20 miles thick. It is free from the violent weather changes which occur below. So, it is preferred by our jet liners. Jet liners, however, face another menace in stratosphere, namely Jet Streams. Jet Streams are high velocity air currents. (See *Jet streams* below). Apart from the danger posed by their high speeds, they give rise to violent overturning of air currents. This overturning is known as CAT (*Clear Air Turbulence*). CAT strikes without warning. It may destroy both the aircraft and the passengers.

In the stratosphere, temperature has a tendency to rise. This is due to the presence of ozone. The air here is highly rarefied and there are only 8 ozone molecules to a million. But this is sufficient to keep the temperature rising.

Ozone Layer absorbs ultraviolet radiation from the sun and converts it into heat and chemical energy. It is this activity that is responsible for the rise in temperature. This layer is not of uniform thickness. Its profile is shaped like that of the earth, being highest at the equator and lowest at the poles. The ozone layer is quite thin—about one-eighth of an inch thick, that is, if it were subjected to the pressure prevailing in the troposphere.

The amount of ozone on the earth is only a fraction of the quantity in the stratosphere. This is a blessing, because any concentration of ozone beyond certain levels is injurious to life, to both plants and animals.

Mesosphere is a relatively quiet region where few energy releasing reactions occur.

Mesopause, a thin layer of extremely cold atmosphere, separates the Mesosphere from the Ionosphere above.

Ionosphere is also known as Thermosphere because of the high temperatures prevailing there—as much as 870°C over the Equator and 1427° C over the North Pole. Almost all the atoms in this region are ionised, that is, their electrons are stripped off by the sun. Large numbers of free electrons flash about in this area. This makes this layer of atmosphere a conductor. The electric waves entering this region are reflected or refracted back to the earth. This reflection enables radio waves to bend and pass round the earth. So, radio waves reaching this layer can be guided around the globe in such a way as to permit them to be utilised in long distance communication.

This is also supposed to be the region where polar auroras occur and where most of the meteors burn themselves out.

Magnetosphere. This is the earth's magnetic belt, where streams of spiralling protons and electrons, pouring out from the sun, are trapped by the earth. This magnetic field extends to about 40,000 miles or some 64,000 km above the earth. (See also *The Sun*.)

Magnetopause. This is the outer boundray of the magnetosphere. Here, the charged particles of the sun take over completely, overriding the feeble magnetism of the earth. Magnetopause thus forms the final boundary between the Earth and Outer Space.

35. WIND BELTS

Wind belts are formed by streams of air moving over the surface of the globe. These movements are caused by differences in atmospheric pressures, which are themselves caused by differences in temperature. It is well known that the density of gases increases inversely to their temperature. The hotter the gas the lighter its density, the colder the gas the higher the density. Hot air moves up and cold air sinks down. Thus where the air is warm and ascending low pressure systems are created and where it is cold and descending high pressure areas come into being. Air flows from high pressure to low pressure regions, much as water flows from high altitudes to low. But such a straight flow of air is prevented by the rotation of the earth. As the earth spins west to east, air motions are deflected and assume rather rotatory patterns. In the northern hemisphere, air circles low pressure systems in a counter-clockwise rotation. It is the other way round in high pressure systems. The rotation of air in low pressure systems is called *cyclonic* and that around high pressure areas, *anticyclonic*. Cyclonic and anticyclonic winds rotate in opposite directions.

Jet Streams

Jet Streams, according to the World Meteorological Organisation, are winds, thousands of miles long, more than 100 miles wide and a few miles deep, with a minimum speed of 100 feet per second.

Jet Streams originate from the differential temperatures of the Polar air and Tropical air. Where these two systems of air meet, their differing temperatures produce corresponding pressure changes. These pressure changes set the Jets in motion. There is always a sizable difference between polar and tropical temperatures. In summer, the difference is lowest—polar air 32°F and tropical air 85°F. In winter, the difference reaches its maximum—minus 40°F in the arctic and 85°F in the tropics. (Tropical air is more or less constant in temperature).

It is the extent of horizontal temperature contrast between the warm tropical air and the cold polar air that determines the wind speeds of Jet Streams and the latitude belts over which they flow. When the difference is the lowest, the wind speed remains at the minimum and the latitudinal area shifts towards the poles. When the difference is very high, wind speeds increase and the Jets edge towards the equator.

Thus, the Polar-front Jet turns towards the pole and passes over Canada in winter, but in summer, it shifts further south and crosses over US. Similarly, the Subtropical Jet which passes over the northern boundary of US in winter, moves south to cross the US-Mexican border in summer. The southward shifts of these westerly Jets, occur around the whole northern hemisphere and leave no room for the Tropical Easterly Jet to develop over India and Africa.

Polar Temperature Changes. Between 1880 and 1940, the Polar temperature appears to have increased. There was a general warming tendency in the northern hemisphere. The result was that the Jets moved further north and also became weaker. Since 1940 arctic temperature has fallen by a little less than 1°C. This is a very small drop but it is sufficient to affect the strength and direction of Jets. With Polar temperature dropping and Tropical temperature remaining constant, the Jets move further south and become feebler.

These changes affect agricultural operations, as a whole, in the entire belt. The worst sufferings come to areas of marginal rainfall. Any shift or weakening of the Tropical Jet would mean that these marginal areas receive less than their normal rainfall. Their normal rainfall itself being scanty, any further reduction will only mean drought and disaster. This was what happened in the sub-Sahara region (around Sahel) in Africa which was hit by a severe drought in 1972 and 1973.

These changes mean trouble for India too. The Tropical Jet, weakened as it is, will not be able to hold its own against the invading Polar Jet. This may delay the onset of the monsoon as well as hasten its retreat, thus cutting short the cropping season. The intermittent droughts, caused by the Polar Jet during the rainy seasons, are also likely to pull down agricultural production.

Four Jet Streams are known: 1. *Polar Front Jet:* This wind blows from the west. It is more or less dormant over certain places but turns quite violent in other places. In its violent mood, it sends down cold air waves southward, followed by thunderstorms, squalls and even tornadoes.

It draws up warm moist air on a vast front, causing widespread rains in the regions over which it roams. 2. *Sub-tropical Jet:* This Jet also blows from the west but occurs only during winter. It circles the globe in 3 successive waves, each of which is approximately 10,000 miles long. 3. *Tropical Easterly Jet:* This appears in summer. It flows from the east in the upper troposphere at a height of about ten miles and covers India and tropical Africa. This stream regulates the monsoon rain in India and Africa. 4. *Polar Night Jet:* This is a westerly jet and appears during winter. It moves at heights between 20 and 30 miles and plays an important role in the transport and distribution of ozone throughout the atmosphere. This stream disappears in summer.

Importance of Jet Streams. The Jet Streams are important in many ways. (i) They are the over-all regulators of weather conditions on earth. These fast and colossal streams draw up large masses of air, as they accelerate. This produces low pressure areas on the surface of the earth. Low pressure systems lead to what is called cyclonic weather conditions—clouds, rains and foul weather generally. In the same way, as the Jets decelerate, they send down huge masses of air into the lower troposphere and create high pressure systems. High pressure systems entail anti-cyclonic weather, namely fine dry weather. (ii) The vertical air motions induced by Jet Streams—ascending air in cyclones and descending air in anti-cyclones—cause rapid and incessant churning and mixing of air between the troposphere and stratosphere. This mixing is beneficial in two ways: (a) It maintains the chemical composition of the atmosphere, especially its oxygen and nitrogen contents, uniform over the globe. (b) It dilutes the pollutants that modern civilization throws up, by carrying them up into the stratosphere and distributing them over a much wider area. This keeps pollution within tolerable limits. (iii) They control monsoon rains over the entire tropical belt.

Behaviour of Jet Streams. Though each Jet goes its own way, the Polar Front Jet and the Subtropical Jet sometimes come together to form one enormous Jet Stream over North America, Europe and Japan. This mighty Jet, speeding at 200 to 300 miles per hour, scatters destruction all the way. Cyclones, howling winds, torrential rains and blizzards follow in its wake. In the Middle East, the two Jets separate. The Polar Jet wends its way over the frozen expanse of Siberia and China. The Subtropical Jet turns towards the Indian sub-continent. It skirts the Himalayas on the south and passes over Pakistan, India, Bangladesh and S. E. Asia.

India. The directional changes in Jet Stream flows and the associated weather patterns are dramatically seen on the Indian subcontinent, where the scenes change radically in a few days. The Subtropical Jet moving over the subtropical high pressure areas produces anti-cyclonic weather condition on the Indian sub continent. This is the beginning of the dry monsoon winter in India in late September. Towards the end of May, the Subtropical Jet retreats almost as suddenly it as came. In a matter of days, it skips the Himalayas and moves into Tibet to join the Polar-Front Jet sweeping over Siberia and China.

The Easterly Tropical Jet now takes over and establishes itself on the Indian sub-continent and S.E. Asia. By this time, the blistering summer sun will have sucked India dry and billows of vapour from the Indian Ocean will have filled the lower troposphere. The disturbances generated by the Tropical Jet induce ascending air motions throughout the depth of the troposphere. This causes air pressure to fall and to form the familiar monsoon depressions in the Arabian Sea and the Bay of Bengal. The moisture-laden air carried aloft by the Tropical Jet forms thunderclouds which release the heavy rains, associated with S. W. monsoon in India.

Polar Jet Invades India. The Indian S. W. monsoon is proverbially erratic. It follows no fixed calendar dates. Sometimes it comes early, sometimes late. Now and then it stops suddenly and starts again. These vagaries are now explained by the erratic behaviour of the Polar Jet. This Jet, instead of staying up in Siberia and thereabouts, wanders now and then into India. The Himalayas poses no problem to the Jets. They soar high above the Himalayas. The presence of the Polor Jet over India triggers dry spells. Sometimes, these spells are prolonged enough to create drought conditions all over India. The Tropical Jet, which prevails in India, is apparently not strong enough to stave off the incoming Polar Jet. These mid-season droughts spell ruin for Indian agriculture.

Monsoon. The word monsoon is derived from the Arabic word *mausim*, meaning season. This implies that the monsoon is a seasonal wind. India banks heavily on the monsoon for its agricultural operations.

The monsoon system extends over a large area—China, Japan, S. E. Asia and India. The system has two branches, Asian and Indian. The Asian system covers China, Japan and all S. E. Asia. The Indian system is mainly confined to the Indian sub-continent, namely India, Pakistan and Bangladesh.

Trade Winds. Two winds that blow regularly towards the equator from the north and south are called the north-east and south-east Trade Winds. Trade winds have nothing to do with trade, although trading vessels, especially in the days of sail, took advantage of them. The epithet *trade* is derived from the word *tread*, that is to say, from the fact these winds blow regularly along a *trodden* pathway in the atmosphere. Trade winds are dry winds that bring fine weather and low rainfall.

Doldrums. During summer the air in the equatorial seas is heated up by the sun. The hot air goes up leaving an area of low pressure. However, the north and south latitudes continue to be high pressure areas. From these high pressure regions called Horse Latitudes* winds blow steadily into the low pressure area. These are the trade winds which blow consistently at about 11 to 14 miles an hour. This region where the trade winds meet is a quiet zone known as the Doldrums. The doldrums change position according to seasons, sometimes moving into the Horse Latitudes. So both the equatorial seas and the Horse Latitudes can be regarded as doldrums.

In the doldrums, the wind is practically still and ships that depended on sails lay becalmed. As the hot sun beats down on the unmoving ships and their stores of food and water run out both men and animals suffer greatly. The doldrums were therefore a nightmare when the ships sailed on wind power. With the advent of the steam ships the doldrums ceased to be a problem.

Westerlies. Westerlies are winds which blow from the tropics to the poles. They are known as South-westerly in the northern hemisphere and North-westerly in the southern hemisphere. The westerlies are, in the main, rainbearing winds and bring in a wet climate.

Tropical Storms are known by different names in different places. They are *hurricanes* (from the Caribbean word *hurrikan* meaning evil spirit) in the US and the Caribbean, *typhoon* in the Far East and *cyclones* in the Indian sub-continent. The Chinese call them *Taifu* meaning great wind, the Japanese have christened them *Akashima* meaning swift wind. The Americans name every hurricane separately. These names are all feminine, *Amy, Betsy, Clara, Daphne* etc.

Technically, the hurricane is a 'cyclone vortex'—a circulation of air around a core of low pressure. It spins clockwise below the equator and anti-clockwise above the equator. To be classed as a hurricane, it must have a circular speed of at least 75 miles per hour. This is the minimum speed. Maximum speeds vary from storm to storm. They may go as high as 150 to 200 miles per hour. A fully developed hurricane may cover an area of some 300 to 400 miles in diameter. They may last 1 to 30 days.

In a single day, a moderately intense hurricane may often release as much heat energy as would be released in the simultaneous detonation of 400 twenty-megaton hydrogen bombs. If converted to electricity, that amount of energy would be sufficient to supply all the electrical needs of the entire United States for more than six months. Furthermore, hurricanes release this energy, day after day, until they weaken and dissipate—that is over a period that averages a week.

Between the great Trade Winds of the north and south lie the Doldrums, a place of calm but not of peace. Here during summer, columns of moisture-laden air rise from the sea. They spiral around a hollow centre. This marks the start of a hurricane. The distinguishing feature of a hurricane is the *eye* or the storm centre.

Around the central eye, winds converge in circles. The circular motion of the air around the storm's eye is due to the rotation of the earth, which deflects winds north of the Equator to the right and those of the south to the left. Towering clouds build up very high walls around the centre. The eye-wall clouds have bases about 500 ft above the surface of the sea. The tops of these clouds go up to 40,000—50,000 ft high. The storm's heaviest rainfall, highest speeds and maximum turbulence are concentrated in these cloud walls. The wall clouds themselves are surrounded by active rainbands which spiral in from the outside towards the centre. It is the latent heat in this moist air that powers a tropical cyclone.

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* The Horse Latitudes came to be so called because ships of old used to carry horses from the Old World to the New. When these ships lay becalmed in this region most of the horses died for want of food and water and were thrown into the sea.

As the winds form, there is a very deep calm—the proverbial calm before the storm. For perhaps half an hour the calm persists. Then from far away in the sea comes a quiet humming sound. Clouds creep over the rim of the sea and spread across the land. They become darker and darker. As the clouds turn pitch black, all hell is let loose. Storms lash out at terrific speeds. Torrential rains driven by gusty winds lay waste the land. High waves pummel the shore battering down everything in their way.

From the Doldrums, the hurricane moves westwards or polewards along fairly regular tracks and devastates islands and coastal areas in its tracks. As a rule, all countries lying along the western sides of the oceans experience hurricane disasters.

One to three hurricanes strike US annually. Betsy (1965), Camille (1969), and Agnes (1972) were some of the worst hurricanes that swept over US in recent years. In the Far East, the typhoon season begins in June, reaching its peak in September and subsiding by November. They originate east of the Philippines and usually travel towards Japan or mainland China, but their route is unpredictable. In 1970 the Philippines experienced three typhoons one after the other. The Bay of Bengal in the Indian Ocean is another cyclone centre. Bangladesh and the eastern coasts of India are hit by cyclonss, almost every year. The 1970 cyclone in Bangladesh is the worst on record in many years.

Hurricane damage results from three principal factors: (1) the destructive force of the wind, (2) the storm surge or the rise of the water level along the coast, as the hurricane moves inland, and (3) the floods caused by torrential rains, which can average 6 to 12 inches in a period of 24 hours or less.

36. BIOSPHERE

The idea of a biosphere (sphere of life) was first suggested by the Austrian geologist Eduard Suess, nearly a century ago. It was at that time an insignificant concept. Today, however, the biosphere has become the most important problem faced by man.

The distinguishing feature of the biosphere is that it supports life. It is estimated that the biosphere contains more than three hundred and fifty thousand species of plants, including algae, fungi, mosses and higher forms of plants, and eleven million animal species ranging from uni-cellular protozoa to man. The biosphere supplies the essential requisites of life for all these species, namely light, heat, water, food and living space or habitats.

The biosphere or the eco-system, as it is generally called, is an evolutionary system. It represents a stable equilibrium of various physical and biological factors which have been operating in the past. The organic continuity of the system rests on a delicate network of interdependent relationships. The air, the water, man and the animals, plants and planktons, the soil and bacteria are all invisibly interlinked in a life-sustaining system we call the environment.

The eco-system or the environment has a rhythm and movement of its own which depend upon a whole set of delicately balanced cycles. All living organisms—microbes, plants, animals, man—have survived by adjusting themselves to the environment and attuning their lives to its rhythm. It is, therefore, absolutely necessary that these cycles should be maintained unimpaired.

Energy Cycle. What keeps the biosphere going is solar energy which comprises 99.98 per cent of the total energy supply of the biosphere. Day in and day out the sun pours forth its energy in the form of sunlight. Light consists of bundles of energy called quanta. The energy content of a quantum of light is proportional to its frequency. The shorter the wavelength, the higher the frequency and the greater the energy content. (see *Outer Space supra*)

Photosynthesis. The process by which solar energy is transferred to molecules is called photochemical process. In this process sunlight excites the electrons in a molecule and kicks them out. This releases electrons to pair with other electrons from a neighbouring atom or molecule and thus forms electron-pair bonds. These new bonds create new molecules. The most important photochemical activity in the biosphere is photosynthesis in plants. Photosynthesis is a complicated process. The light absorbed by chlorophyll molecules and by other pigments in plants is transferred to electrons in such a way as to create strong oxidants, that is, molecules that readily remove electrons from other molecules (oxidise them), or reductants, that is, molecules that readily supply electrons to other molecules (reduce them). It is these oxidants and reductants that assist plants in producing carbohydrates and oxygen from molecules of carbon dioxide and water. Plants respire (give out) oxygen but retain carbohydrates which are converted to energy and stored in the form of chemical bonds, notably those of adenosine triphosphate (ATP) which is the basic energy currency of all living cells. High energy phosphate bonds of ATP contain 12000 calories and release 7500 calories when broken.†

This energy is carried up the food chain by herbivores feeding on plants and carnivores feeding on herbivores. Omnivores like man draw their energy both from plant and animal sources. Much of the energy drawn by plants and animals (including man) is consumed and spent in maintaining the process of life.

"From the moment of conception until we die, we burn literally as a candle. This is no casual simile, for we both consume and are consumed and death comes when the process stops. As long as we live, as in the case of the candle, oxygen and other substances are drawn in, take their place and burn with the release of energy and other end products until at last the process of replacement drops below consumption and the flame of life and candle flickers out... For virtually every atom and molecule in the body is periodically replaced...Every tissue and cell is continually being either rebuilt or replaced, whether skin, blood, hair or bone and those bald spots and retreating hairlines are less a case of hair falling out than of new hair failing to grow in the place of old."*

The energy that is not expended in the course of life is stored in dead matter. Decomposing bacteria break up the dead matter and convert it into *humus* or *organic sediments*, releasing carbon dioxide, water and heat into the biosphere. Thus the basic ingredients of life are returned to the soil. The plants draw their nutrients from the soil and keep the cycle going.

Heat Cycle. Heat is one of the prime requisites of life. This is supplied by solar radiation. It is calculated that the solar heat reaching the earth's orbit (just above the atmosphere) amounts to about 2 calories per sq. centimetre per minute. But the earth gets only less than half the radiation reaching the top of the atmosphere.

About 2 per cent is absorbed by the ozone layer in the atmosphere. Atmospheric water vapour, carbon dioxide and dust particles absorb around 18 per cent. The clouds reflect back into space some 23 per cent. About 22 per cent is scattered by the atmospheric dust. The earth receives only the balance of 38 per cent. But the story does not end there. Out of the 38 per cent solar radiation received, the earth re-radiates about 7 per cent by long wave radiation, thus reducing the stock of terrestrial energy to 31 per cent. At the same time, out of the 22 per cent scattered by the atmosphere, 16 per cent ultimately reaches the earth as *diffuse radiation*, the rest 6 per cent being irretrievably lost in space. Thus, on the whole, the earth receives about 47 per cent of the solar energy reaching the atmosphere. Meanwhile, the atmosphere acting as an intermediary between the sun and the surface of earth, retains about 5 per cent of the energy as sensible heat and about 24 per cent as latent heat in water vapour.

It is essential that the absorption and re-radiation of heat should ultimately balance. Otherwise the earth would experience a net increase in heat or a net decrease according as a surplus or deficit of heat results from radiation. The balance between absorption and re-radiation is mainly regulated by water vapour in the atmosphere. There is only a very little amount of water in the atmosphere, about 0.001 per cent. This insignificant amount of atmospheric water exercises an influence on the climate of the earth, out of all proportion to its total mass. Besides keeping the balance between the absorption and radiation of heat, it controls the water cycle and determines our climatic conditions.

Carbon Cycle. The biosphere contains a complex mixture of carbon compounds, in a continuous state of creation, transformation and decomposition. Practically all organic matter originates in the process of photosynthesis. The plants use the radiant energy of the sun to convert carbon dioxide and water into carbohydrates by splitting water to derive hydrogen, and by drawing in carbon dioxide from the air. In the process, the plants release free oxygen(O_2) into the atmosphere. While plants absorb carbon dioxide during photosynthesis, all living organisms respire and release carbon dioxide and decomposing bacteria do the same in regard to dead matter. But while respiration and decomposition go on all the time, photosynthesis takes place only during daytime. During daytime, carbon dioxide in the atmosphere comes down from an average of 320 parts per million to around 305 parts but at night it increases, going up to as much as 400 parts per million, near the ground level.

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† The energy contained in a molecule is locked up in the bonds that connect the atoms to one another. The strength that is required to break these bonds is the measure of energy contained in the molecule. This is usually expressed in Kilocalories (Kcals) per mole (See *International Units* infra). A single bond between two carbon atoms can be broken with 82.6 Kcals, a double bond requires 145.8 Kcals and a triple bond 199.6 Kcals.

* Norman J. Berrill.

Apart from the daily production and consumption of carbon (in the form of carbon dioxide), the earth has a vast stock of carbon in permanent form. This stock consists of inorganic deposits (mainly carbonates like calcium carbonate etc) and organic fossil deposits (chiefly coal, shale and oil). When we burn fossil fuels, we are merely adding more carbon dioxide to the atmosphere which has an excess supply already.

Oxygen Cycle. Oxygen not only supports life but also plays a fundamental role as a building block of practically all vital molecules accounting for about a fourth of all the atoms in living matter.

The most recent factor affecting the oxygen cycle of the biosphere and the oxygen budget of the earth is man himself. He inhales oxygen and exhales carbon dioxide, thus reducing the stock of oxygen and increasing the supply of carbon dioxide. He goes further and burns fossil fuels, depleting the oxygen supply still further. He reduces photosynthetic activity by cutting down forests and replacing them with cities.

It was believed till recently that the primordial atmosphere did not contain oxygen. The oxygen now in the atmosphere was put in by the plant kingdom through photosynthesis. Oxygen started accumulating in the atmosphere about 1.8 billion years ago.

This view has recently been questioned. Some astronomers think that the original supply of oxygen in the atmosphere came from the ultraviolet rays of the sun which broke up the water molecules in the upper atmosphere into hydrogen and oxygen (see *Atmosphere* supra). Whatever may be the initial source of the oxygen in the atmosphere, what is important is that the plants are now augmenting the oxygen supply by photosynthesis. They are not only augmenting our oxygen supply but also reducing the total supply of carbon dioxide which is increasing to alarming dimensions.

Nitrogen Cycle. Nitrogen as it obtains in the atmosphere cannot be used by the higher organisms. It has to be 'fixed', that is, incorporated into a chemical compound. Nitrogen, in other words, has to be converted into *ammonia* or *amino acids*, so as to be of use to plants and animals.

Nitrogen Fixation. Fixation of atmospheric nitrogen on land is carried out by organisms called diazotrophs who possess the genetic code for the synthesis of enzyme nitrogenase which catalyses nitrogen fixation. These organisms fall into two broad classes—symbiotic and non-symbiotic. Symbiotic diazotrophs operate in association with some species of plants like legumes. They contribute the lion's share (83%) of nitrogen fixation on land. Non-symbiotic agents who contribute the rest (17%) include blue green algae, and aerobic (those requiring oxygen) bacteria and anaeorobic (those who do not require oxygen) bacteria.

The total annual nitrogen required by the biosphere is estimated to be 1050 million metric tonnes (mmt). Of these the diazotrophs account for only 140 mmt. Non-biological agents like lightning or fire contribute 40 mmt. The balance of 870 mmt. comes from nitrogen locked up in dead plants and animals. These are recycled by nature as nitrates. The nitrates are converted into amino acids by decomposing bacteria. In aerobic conditions, where oxygen is available, bacteria will again intervene to oxidise the amino acids into carbon dioxide, water and ammonia. Thus nitrogen in the form of ammonia is returned to the atmosphere, where it gets dissolved in rain water, and ultimately replenishes the earth.

Man has interfered with this natural cycle by industrially fixing nitrogen. He is now converting nitrogen into assimilable forms by artificial methods. Production of nitrogenous fertilisers has increased phenomenally in the last few decades. This means that there is an extra input of nitrogen into the atmosphere. This extra input is already larger than the natural output. We cannot now say how far this extra input will affect the biosphere or in what direction.

Water Cycle. Water plays a versatile role in the functioning of the biosphere. It is essential to all forms of life, plants, animals and man. The water cycle has two distinct branches—the atmospheric branch and the terrestrial branch. In the atmosphere, water exists mainly in a gaseous form. On the earth, liquid forms and solid forms (ice) predominate.

Water is important to the biosphere in that it is from water that the biosphere draws its most abundant element, hydrogen. Hydrogen in the form of carbohydrates constitutes a very important source of energy for all living things. Although we have a plentiful supply of water in the oceans, it is not of direct use to us. We depend upon a small stock of water—less than 1 per cent—contained in our rivers and fresh water lakes and in the subsoil. This little stock of water is replenished by an even smaller stock of mobile water—less than 0.001 per cent—which circulates in the atmosphere as water vapour, much of which ultimately falls down as rains.*

The water cycle of the biosphere depends on the reciprocity of evaporation and precipitation. Liquid water on the earth goes into the atmosphere as vapour by evaporation and transpiration of the plants. The vapour is returned to earth (precipitation) as rain or snow. Evaporation and precipitation are not uniform everywhere on the earth. Although some areas receive very heavy rainfall and other parts have little or no rain, the total quantities of evaporating and precipitating water must tally on a gobal scale and they do.

But it is some of the peculiar properties of water that make it a powerful agent in the energisation of the biosphere: (1) Most materials expand when heated and contract when cooled, but water reaches its minimum volume above freezing point at 3.9°C. When it is cooled further, it freezes into ice and expands 10 per cent to make it a relatively light solid. (2) Water is the only substance that we commonly see around us in all states—solid, liquid and gaseous. The changes from one state to another (from solid to liquid to gas and vice-versa) which frequently take place, represent great changes in energy distribution. Cooling and freezing water gives up heat. Warming and vaporising water absorbs heat. (3) Among liquids, water has the greatest specific heat (the ability to store heat energy for a given increase of temperature). This means that a lot of heat can be carried in a relatively small mass of water. (4) With the exception of mercury, water has the greatest thermal conductivity of all liquids. These properties enable it to function as a storehouse and carrier of energy in the biosphere.

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* See *Hydrosphere* supra.

37. ECOLOGY

Ecology has been defined as the study of organisms in relation to their environment. This is a vast subject, covering as it does, the whole world of organic life—plants including fungi, animals including microbes and man. Then, there is the environment itself, which includes not only the animate organisms that populate the biosphere but also the inanimate forces operating in nature.

The scope of ecology being so vast, it cuts across other major sciences—Physics, Chemistry, Biology, Anthropology etc at various points. We have therefore to study ecology in relation to these major sciences and in terms of their inter-relations to one another. Ecology thus turns out to be not only vast but also extremely complicated—so complicated that its ramifications virtually defy analysis.

The Ecological Crisis. Though ecology covers all species of life, the species which occupies the centre of the stage is man, because he, alone of all species, had set out on a confrontation with nature. His fight with the established natural systems has had a long history. But it is only in the latter half of the 20th century that it had assumed the proportions of a crisis. This is what is described as the Ecological Crisis.

When man gave up living on what food he found in nature and settled down to grow his own food, he began interfering with natural systems. This happened during the very dawn of history when man built the first great river valley civilizations of Sumeria, Egypt and the Indus Valley. Ever since, man has been incessantly engaged in struggles of one kind or another with natural systems. Since the Industrial Revolution, his interference with the ecosystem had increased both in volume and in intensity. Man had by the time colonised the far corners of the earth. Everywhere he went he had fought nature and won. In the first flush of success he described his progress as the *Conquest of Nature*. Now he wonders who is conquering whom.

Exploitation & Stability. It is evident that man has to exploit natural systems, if he is to assure himself of better living conditions. When we clear virgin land and plant crops we are unbalancing a functioning natural system. Once we unbalance a natural system we have to maintain that imbalance in order to grow more crops in future. There is thus an ever present conflict between man's need to exploit his environment and nature's need to maintain its stability. This is inevitable. As Gordon Harrison puts it, "If man is to continue to exploit the natural systems to his own advantage, then his first prescription is to see that these systems stay around to be exploited".

"The question", says Dr. Holling, "really concerns itself with the stability of the natural systems, in the degree to which they can absorb disturbances and this is

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The Dodo

"The dodo", wrote the American humourist Will Cuppy, "seems to have been invented for the sole purpose of becoming extinct and that was all that he was good for." Cuppy's gibe at the poor dodo is no hyperbole. The dodo was first sighted in 1507. By 1681, barely 75 years after, it had become extinct.

The dodo is native to Mauritius, an island in the Indian Ocean. The Portuguese sailors were the first to see the bird, when they landed on the island in 1507. Dodo belongs to the pigeon family but is flightless. What we know about these birds comes from the reports of the Portuguese sailors. They were ungainly in appearance, slow and clumsy in their movements and quite fleshy. A bird weighed anything between 25 and 50 lbs. The Portuguese sailors shot them for food. The birds were reported to be so stupid that they simply stared at the guns trained on them. This led to their quick extermination. The last bird was seen in 1681.

In recent years it was noticed that a big tree, native to Mauritius, Calveria major, was getting depleted in numbers. In 1973 there were only 13 calveria trees in Mauritius, all of them around 300 years old and dying.

Researches conducted by Stanley A. Temple and others of the Wisconsin University, USA, have shown that the calveria seeds depended on the dodo for germination. These trees produce big fruits but their seeds do not germinate even in nurseries, because the seed is encased in a stout epicarp, about 15 millimetres thick. The epicarp is too strong for the embryo to break through. The dodo which consumed this fruit in plenty softened the epicarp in its gizzard. This made germination possible. With the disappearance of the dodo there was no natural agency left to aid the calveria seed to germinate. The last dodo and the last natural germination of the calveria seed corresponded in point of time — 300 years ago.

The dodo is dead and gone and the calveria tree is following the dodo to its doom. The pity is that we now know why the calveria tree is becoming extinct but there is nothing we can do about it.

Source: Scientific American, 1977.

really the central question that ecologists have been facing. We do know that despite arguments for the delicate balance of nature, natural systems are profoundly resistant to change. But....this resistance is not infinite". It can and does break down under persistent attack.

In the circumstances, the sensible course for man is to stop and consider how the natural systems react to his exploitation and assess their powers of endurance and resilience before he proceeded to exploit further. But this is precisely what mankind has so far refused to do.

Interdependence of Species. In the eco-system all species of life, plant and animal, are inter-linked with one another. Interference with any species will have long standing repercussions on others. We have been massively intervening in the environment without quite understanding its complications. Often enough, we realise the magnitude of the damage we have wrought long after the mischief had been done and the situation has passed beyond repair. The dodo is a typical case (see Box, p. 134).

Environmental Amplification. It is clear that the biosphere is an integrated whole and that its numerous parts are inter-connected. Prof. Barry Commoner points out that these inter-connections, especially along the food chain, accelerate the impact of our inroads into the environment and amplify them greatly. Commoner gives the following example. If we put one unit of insecticide per gram in the soil, the earthworms living in the soil will contain 10 to 40 units per gram and in woodcocks feeding on the earthworms, the insecticide level will rise to 200 units per gram. Says Prof. Commoner, "In the biosphere the whole is greater than the sum of its parts.... Because of such amplification, a small intrusion in one place will trigger a huge response elsewhere in the system. Often the amplification feeds on itself until the entire living system is engulfed.....It is not surprising then that the introduction of any killing chemical into the environment is bound to cause a change somewhere in the tangled web of relationship".

Natural Resources. "Our physical milieu", as Prof. Harold Cassidy‡ reminds us, "is finite, not only the surface of the earth, but the waters of the sea and the gases in the atmosphere". Land is limited and good land scarce. There is plenty of water in the sea but it is not infinite. Anyhow, the supply of usable water is woefully short. (see *Hydrosphere* supra). Even air which is freely available everywhere may run short of the most vital gas that we need and need every moment—oxygen. Add to this, the fact that we are recklessly exploiting all natural resources, coal, oil and minerals and we have a perfect set-up for a crisis of resources. We do not seem to be aware of any such impending crisis, judged by the way we are squandering our resources. But any moment, a shortage of one or the other may stare us in the face.

Land & Water. Agriculture was man's first great challenge to natural systems. He cleared forests to grow food for himself and built huge irrigation systems to assure a perpetual supply of water for his crops—and prospered. The ancients knew, as Plato tells us, that over-cropping and over-grazing will lead to soil erosion which may make deserts of fertile land. But that did not stop them. Look at the debris which our great civilizations have left behind them.

Ancient Sumeria—modern Iraq—was the granary of the great Babylonian Empire. The Sumerians harvested two crops and grazed sheep between the crops. Today less than 20 per cent of the land in Iraq is cultivated. "The landscape is dotted with mounds representing forgotten towns, the ancient irrigation works are filled with silt—the end product of soil erosion—and the ancient seaport of Urs is now 150 miles from the sea with its buildings buried under as much as 35 feet of silt".*

Take a much later civilization in another continent—the Mayan civilization in America. "Archaeologists have long wondered how the Mayas managed to support what was obviously a high civilization on the now unproductive soils of Guatemala and Yucatan. Evidently, they exploited the land as intensively as possible until both its fertility and their civilization collapsed." "Sorry stories like this could be told of country after country."†

Apart from erosion there is another factor that may convert good land into barren tracts. This is salinity. Salinity appears where the groundwater table is lowered owing to the excessive consumption of groundwater resources. All over the world there are large tracts of land blighted by salinity—in Mexico and several other parts of America, in Tanzania and many other parts of Africa, in India, China and south east Asia. In spite of this bitter experience, the reckless tapping of underground water goes on merrily all over the world. Peter White writing on Greece in the National Geographic (March 1980) says, "Driving eastward in Macedonia, I get more intimations of new-found prosperity....Around Pella so many wells have been dug that the fountain of Alexander the Great has dried up".

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‡ Professor of Chemistry, Yale University.

* La Mont Cole, Chairman, Dept. of Zoology, Cornell University.

† Ibid.

Irreplaceable Losses. We have through the centuries created vast deserts of fertile lands. But we do not yet know how to make the deserts bloom. Despite the claims of Israel, it is still a far-off dream. All our natural resources are going the same way. We are consuming our minerals with an abandon that is hardly credible. According to one 'guestimate' iron may last till 2500 A.D. Aluminium and magnesium and some other minerals may be available till 2100. But lead and several other materials may disappear even earlier, say by about 2050 A. D. There are several other guestimates. They all tell the same tale. We are running dangerously short of essential raw materials.

Since the Industrial Revolution our exploitation of natural power resources, coal and oil, has assumed alarming proportions. The Industrial Revolution itself was powered by coal. Then came oil. Both threaten to give out, oil sooner than coal (see *Coal, Oil*). Now that the OPE countries are holding the rest of the world to ransom for oil, we have begun to think of alternate sources of power that will not run out on us like coal and oil. This is the only silver lining on the overcast power front.

What we destroy, we can't replace. Nor can nature—not at this speed. It has taken millions of years for nature to stock up our present supply of minerals and fossil fuels but it will take us only a few centuries to run through them. As pillagers and predators, we surpass all other species just as we do as thinkers and creators. Only our thinking and creative abilities are poor compared to our capacity for unthinking destruction.

Fouling the Environment. No bird fouls its own nest. But the doubly wise man (homo sapiens sapiens)¶ excels in this obnoxious practice. It has been estimated that in Britain the average person throws out about 1.5 lb of garbage every day. In the US the wastes dumped into the biosphere are much greater—more than 4.5 lb per person per day. To these familiar wastes are added whole heaps of industrial by-products, which neither the producer nor the consumer wants.

The advance of technology in recent years has been dubbed the *Technological Revolution*. This revolution, like all revolutions, has backfired. While at one end it has hastened the consumption of scarce materials, it has at the other end thrown up a lot of unwanted wastes. These wastes are piling up and have already become unmanageable. Some of these wastes like synthetic plastics are not 'bio-degradable'. Therefore they may persist for years as abiding threats to the eco-system.

Pollutants. But worst of all are the pollutants which a sophisticated technology has been spewing all around us. Prof. Cassidy tells us (1954) that in the fifties pollution products of the city of Los Angeles per day were 85 tons of aldehydes, 14 tons of ammonium products, 460 tons of oxides of sulphur, 1500 tons of organic materials and 150 tons of acids. (Figures rounded off).

Regarding the direct and indirect effects of such pollutants, Cassidy says, "Careful studies have shown that air pollution can damage vegetable crops and in general affect plant growth. This is reflected in the low nutrient quality of the plant products and consequent ill effects on the health of the animals and people who depend upon these crops. Here again, we have a remarkable ***amplification***‡. But far more important are effects that arise secondarily".

Cassidy argues that constant exposure to such deleterious chemicals can produce asocial attitudes, moroseness, sullenness, 'seclusive and sometimes hostile or paranoid behaviour', dopeyness and indifference to surroundings sometimes approaching lethargy. Going a step further, Cassidy says that if it so happens that the people who are so exposed have to or do take major decisions on community matters, it would be calamitous. "We have here a factor, that is not mentioned in listing the causative reasons for riots, crime and the less spectacular idiocies, that we see practised in our cities".

Effluents. These are wastes containing assimilable nitrogen and phosphates which our factories are discharging into surface waters, like rivers and lakes. They enrich the water leading to the overgrowth of algae and similar organisms to the detriment of other organisms and finally to the extinguishment of all. "As large a body of water as Lake Erie", says Commoner, "has already been overwhelmed by pollutants and has in effect died...Sewage and industrial wastes and run-off from heavily fertilised farmlands have loaded the waters of the lake with so much excess phosphate and nitrate as to jar the biology of the lake permanently out of balance. The fish are all but gone".

¶ See *Descent of Man* infra

‡ See Prof. Commoner above

Oxygen & Carbon dioxide. The widespread use of combustible fuels bodes ill for all species of animals in two ways. It depletes the oxygen supply and increases carbon supply. "When and if we reach the point, where the rate of combustion exceeds the rate of photosynthesis, we have not only to worry about running out of oxygen at night (there is no photosynthesis in the absence of light) and in winter but the oxygen content of the atmosphere will actually decrease"†† while the carbon dioxide content increased. "Between 1860 and 1960, the combustible fuels added nearly 14 per cent to the carbon dioxide content of the air, which had until then remained constant for many centuries"** When you burn a ton of hydrocarbon you obtain as byproducts about one and one-third tons of water and about twice this amount of carbon dioxide. "Both carbon dioxide and water vapour make a huge green house of the earth because while they allow sunlight (short wave radiation) to reach the earth, they prevent longwave heat radiation from the earth escaping into space (see *Heat cycle, Biosphere* supra). The temperature of the earth is therefore certain to rise as the amounts of carbon dioxide in the atmosphere increase".

"However, the greatest single source of contamination of the planet now is radio activity, from the explosions of nuclear weapons in the atmosphere. Fallout from nuclear tests contaminates every part of the earth's surface and all its inhabitants".†

The Abating Crisis. "The technological dream", wrote Taylor, "is becoming a nightmare and it is time to wake up or we may die in our sleeep".‡ We have woken up. The nations of the world, developed, developing and undeveloped, are taking care to conserve the natural systems and natural species, both plant and animal that constitute the ecosystem. In every country thousads of hectares of parkland and forests have been and are being set apart protected by law from vandalism and despoliation. The ecological crisis has been taken well in hand. It is no longer terrorsome or intractable. "Right now", says P. A. Jordan,¶ "we know enough about environmental reactions to remove man's dilemma from at least the *crisis category* without need for any further technological development. We know how to stabilise soils in farm, field and forest throughout the world. We can manage plants and animals, wild and domestic, for high sustained yields. We know the source and threat of most pollutants and we have technical answers (not always "economical" ones) for abating them. We observe that certain changes in man's structure and in the biota surrounding him can modify visual, auditory and olfactory stimuli along with interpersonal responses, so as to greatly improve his personal wellbeing. And we know of simple techniques which permit man to control his reproduction while not interfering with his dignity....However, at this point in our history, it is not a lack of such technologies that underlies our crisis; it is rather our failure to put them to work....."

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†† La Mont Cole

** La Monti Cole

† Barry Commoner

‡ Doomsday Book

¶ Wild Life Ecologist, Yale University

38 EVOLUTION

The Changing Earth. Since the Earth came into existence some 4600 millions of years ago, it has had a history of continuous change. Its surface had been broken apart and re-formed by violent geological movements from time to time. Old mountains have been weathered down to stumps while new mountains have been built. Land has been sub-merged under the sea in certain places and the sea has given way to land in others. The face of the earth kept changing like the patterns in a kaleidoscope through successive geological eras. As continents and seas changed and climates altered, life was modified time and again, to suit the changing environment.

Geological History. The geological history of the earth is divided into two great Eons, the *Cryptozoic Eon* or the age of hidden life and the *Phanerozoic Eon* or the age of well displayed life. The Cryptozoic Eon covers all of what is called the Pre-Cambrian era and goes back to the very beginnings of the earth. The Phanerozoic Eon includes all eras beginning with the Cambrian Era and coming down to the Holocene Era which covers the modern times.

The Eras themselves are subdivided into periods or systems depending on the dominance of one or another kind of flora or fauna. There are four major eras. 1. The Pre-Cambrian Era. This is the only era that belongs to the Cryptozoic Eon. 2. Palaeozoic Era. This is the first era of the Phanerozoic Eon, and shows old forms of life. 3. The Mesozoic Era, the second era of the Phanerozoic Eon, shows middle forms of life. 4. The Caenozoic Era, the last era of the Phanerozoic Eon, shows the recent forms of life.

The Caenozoic Era. While the Palaeozoic and Mesozoic eras have been divided into regular periods, like the Cambrian age or the Triassic age, the Caenozoic era has been divided into sub-eras and then divided into periods like the Palaeocene, Eocene or Oligocene ages. At first, the Caenozoic era was divided into three minor eras as follows. The *Primary*, comprising the oldest rock formations, the *Secondary*, comprising intermediate rock formations and the *Tertiary* (third) comprising the youngest rock formations. When still younger rocks were discovered, they were classed as *quaternary* (fourth). The two important sub-eras of the Caenozoic era are the *Tertiary* and the *Quaternary* (See Table below).

The current geological period is called the Holocene age which began 10,000 years ago. The earliest geological era is Pre-Cambrian which began 4600 million years ago.

Table 35
Geological Time Scale*

Eras & Sub-eras	*Beginning of Period-Millions of Years ago*	*Periods*	
		Name	*Meaning*
Pre-Cambrian	4600	Archaean or Azoic	Ancient or lifeless
		Proterozoic	First life
Palaeozoic	600	Cambrian	After Cambria, the Latin name for Wales.
	500	Ordovician	After Ordovices, ancient inhabitants of Wales.
	440	Silurian	After Silures, primitive inhabitants on the borders of England and Wales.
	400	Devonian	After Devonshire in England.
	350	Carboniferous	Coal-bearing.
	270	Permian	After Perm, a province in Russia.
Mesozoic	225	Triassic	Threefold i.e. having 3 sub-periods, upper, middle and lower.
	180	Jurassic	After Jura mountains on the border of France and Switzerland.
	135	Cretaceous	From Latin Creta, meaning chalk.
Caenozoic, Tertiary	70	Palaeocene	Ancient-recent, that is, earliest recent forms.
	60	Eocene	Dawn of recent forms.
	40	Oligocene	Slightly recent i.e. few forms recent.
	25	Miocene	Less recent, i.e. a minority of forms recent.
	3	Pliocene	More recent, i.e. majority of forms recent.
Quaternary	1	Pleistocene	Very many (great majority of) forms recent.
10,000 years ago		Holocene	Entirely, i.e., all forms recent(modern age).

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* After Dr. A. K. Dey, *Geology of India*.

Geological & Biological Changes

I. **Cryptozoic Eon** opens with the very beginning of the earth, when it starts as a whirling mass of gas, held by the gravitational pull of the Sun. The gases condense into liquids and liquids solidify to form the outer crust of the earth. The thick steamy vapour surrounding the earth falls down as heavy rains to produce the first oceans and rivers. The rocky crust, baked by hot winds and cooled by heavy rains, weathers down to form soil and sand.

Pre-Cambrian Era (4600 million to 600 m. years ago). First signs of life represented by microcosms, appear in this age.

II. Phanerozoic Eon covers the entire period from Cambrian Age to Holocene Age.

1. Cambrian Age (600 to 500 m. yrs.). Rocks form on the earth. Climatic conditions become warmer. Life exists only in the seas. Seaweeds remain the only plants. Worms, jellyfish and sponges form the main groups of invertebrates.

Ordovician age, 500—440 m. years. Seaweeds and invertebrates continue in the seas, but the first vertebrates appear.

Silurian age, 440—400 m. years. Plants appear on land. More species of vertebrates appear in the seas. Plant life becomes more varied in the seas and coral reefs develop.

Devonian age, 400-350 m years. Vegetation begins to thrive on land. The first fishes appear in the seas. The first invertebrate animals, millipedes, mites, spiders and wingless insects appear on land.

Carboniferous age, 350-270 m. years. Giant evergreen plants appear in tropical swamps. Amphibious creatures evolve. Marine life in plants and animals show many varieties. Reptiles breed on land. Some insects develop wings.

Permian age. 270-225 m. years. The super-continent *Pangaea* breaks up, creating *Laurasia* in the north and *Gondwana* in the south.

Deciduous plants able to withstand extremes of climate dominate. Land animals increase in variety and numbers and end the dominance of the marine creatures.

Triassic age, 225-180 m. years. Gondwana breaks up into two blocks: (1) South America and Africa, with Arabia attached, (2) Antarctica, Australia and India.

Coniferous plants, cycads and ferns increase. Some cycads have embryonic flowers. The first mammals (warm-blooded creatures) evolve from the reptiles. Dinosaurs, barely six inches long, are present for the first time. The first flies and termites appear.

Jurassic age, 180-135 m. years. India breaks away from Antarctica and Australia and moves north. Australia is parted from Antarctica. South America and Africa separate.

Reptiles increase in size and variety on land. The first birds evolve feathers from scales. Huge reptiles weighing as much as 34 tons roam the earth. Mammals remain small, no bigger than rats, and live in the woodlands.

Cretaceous age, 135-70 m. years. India jams into South Asia lifting up the Tibetan Plateau and the Himalayan Ranges. The Andes form in South America.

Giant reptiles like the dinosaurs dominate the land at the beginning of the age, but disappear towards the close. Placental mammals (whose young are nourished directly by the mother's blood until birth) appear.

Palaeocene age, 70-60 m. years. Striking climatic variations and physical changes occur, as a result of widespread elevation of land out of sea. Many organisms perish. The surviving species give rise to fresh stocks, by specialisation of structure and habit to suit the changed environmental conditions.

Eocene age, 60-40 m. years. Flowering plants dominate. Marine reptiles become extinct. Some species of mammals like the whale and the sea-cow adapt themslves to the sea. Most fish assume the present forms. The ancestors of the big mammals—elephant, rhinoceros, horse and cattle—appear. Primitive monkeys are seen.

Oligocene age, 40-24 m. years. Land mass moves at the expense of the sea. The Alps begin to form. The Himalayas rise higher.

New species of crabs and snails evolve. The ancestors of cats, dogs and bears appear. Tailless primitive apes are seen. Plant-eating animals increase.

Miocene age, 25-3 m. years. Arabia separates from Africa and attaches itself to Asia. The Red Sea and the Gulf of Aden form. The Mediterranean is land-locked. The Himalayas rise still higher.

Bony fish increase in variety. Elephants and other mammals grow in size.

Pliocene age, 3-1 m. years. The continents assume the present forms. Land subsidence leads to the formation of the North Sea, Black and Caspian Seas and the Sea of Aral.

Marine life assumes more or less the existing forms. Mammal species decline in variety. Man-like apes and elephants thrive. Mammoth creatures on land and sea become extinct.

Pleistocene age, 1 million years. A period of abnormal and extreme climatic changes. Mountainous ice sheets cover the major portion of the earth. The ice melts

12

Flying Giant

The biggest bird alive now is the ostrich and it cannot do what most birds can, that is, fly. The largest flying bird today is the condor of the Americas. However, when compared to the 'jumbo' of the bird world these are mere pygmies. Two Argentinian paleontologists, Eduardo Tonni and Rosendo Pascual, have found the fossils of a giant flying bird. Weighing about 77.5 kg, it measured 3.4 metres from the tip of its beak to its tail tip; each wing measured about 1.2 metres and the largest wing feathers measuring 1.5 metres long were about 18 cm across. It stood 1.8 m tall and its wing-spread was 7.5 m. It is said to have sailed the skies some eight to five million years ago.

Source: Science To-day.

periodically raising the sea level. Land masses, pressed down by ice, begin to rise as the ice retreats. Melting ice forms the Great Lakes of America and the lakes in Southern Europe.

Many plants in Europe perish leaving only hardy trees like oak and elm. Ape-like creatures begin to make tools. Modern elephants, horses and oxen appear.

Pleistocene age (otherwise known as Ice age) is generally sub-divided into (1) Lower Pleistocene, between 1 million and 500,000 years ago; (2) Middle Pleistocene, between 500,000 to 100,000 years ago and (3) Upper Pleistocene, between 100,000 and 10,000 years ago.

Holocene age. This is the present geological age which began 10,000 years ago. Ice retreats and warmer climate prevails over the major portion of the earth. Vegetation thrives. Man learns the domestication of animals and the science of cultivation.

39. DESCENT OF MAN*

Biological Status. Man has appropriated to himself the highest echelon in the biological hierarchy. But for all his pretensions of superiority he could not rid himself of many characteristics which he shared with lowlier species during the evolutionary process.

Biologically man belongs to the family of mammals and among mammals to a subfamily called the placental mammals. As a mammal he shares with other mammals, warm blood, hair and milk glands. As a placental mammal his young are carried by the female for a long period prior to birth, attached by a placenta to the uterus, through which the child receives nourishment from the mother's bloodstream.

Mammals. The mammals are today the most biologically advanced species and dominate the world of organic life. But more than 75 millions of years ago when gigantic reptiles ruled the earth, the mammals were a frightened and insecure group. In order to survive and reproduce "this early stock of hairy warm-blooded creatures (of whom the tiny shrew is typical) had to keep to secret ways or to the dark, had to eat whatever could be found and had to carry their developing young within them rather than lay eggs where they could too easily be discovered (by other animals). They were on the run, driven more or less underground or to foraging at dusk or through the night—a desperate kind of life that demanded a high fertility and a quick replacement of generations."‡ This explains the fantastic evolutionary progress that the mammals had achieved. They had changed from the tiny scurrying creatures they were into undaunted hunters lording it over all other species.

Primates. Among mammals, man belongs to the order of Primates. The Primates are distinguished by hands eminently adapted for grasping, an excellent vision, a keen sense of hearing but a poor sense of smell. The primates consist of monkeys, apes and man. The monkeys form a class by themselves, called the Lower Primates or Prosimians. Lemurs, lorises, tarsiers and tree shrews belong to this group.

Anthropoids. Man and the apes together make up the Higher Primates or anthropoids. The anthropoids are in their turn divided into two groups, the *Pongidae* (apes) and the *Hominidae* (man). The hominidae differ from the pongidae in the shape and structure of the pelvis, legs and feet. This means that the hominidae can walk upright on their legs while pongidae have to use their hands as well for locomotion. The pongidae comprise four families—the gorilla and the chimpanzee of Africa and the gibbon and orang-utan of South-East Asia. The hominidae consist of only one family—man.

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* The title 'Descent of Man' used by Darwin has been amended by a later anthropologist as the 'Ascent of Man', which is also true.

‡ Norman J. Berril —(Bracketed sections ours).

Ancestors of Man. We know very little of our biological ancestors. What little we know has been gathered by studies of the fossil remains of early apes and men. Various fossils have been unearthed. They have been named after the localities, where they were first found and classified accordingly. Thus we have the Heidelberg man (found near Heidelberg in Germany in 1907), the Solo man (found on the banks of the Solo river in Java in 1932), the Ternifine man (found at Ternifine, Algeria, in 1954) etc. New fossils are also coming to light. Among these the following may be noticed: The *Laetolil* man discovered by Mary Leaky in 1974-75. This species lived between 3.35 and 3.75 million years ago. The *Hadar* man discovered by Johanson and Taieb in 1974-75. This species lived about 3 million years ago. *Lake Turkana* man (Rudolph man) discovered by Richard Leaky in 1972 and 1975. The 1972 species is about 2 to 3 million years old, while the 1975 species is about 1.5 million years old.

The descent or ascent of man is still an unresolved question. As Dr. Ashley Montague says, "It is often stated that man is descended from the monkey or variously from the gorilla or the chimpanzee. Such statements are wholly unsound. Man in common with these animals belongs to the same order of mammals—the order of primates but his kinship with the monkeys is very remote while his relationship with the African anthropoids, the chimpanzee and the gorilla, is *collateral* not *lineal*. That is to say, though the anthropoids and man were probably derived from the same stock, their evolutionary history proceeded on disparate and divergent lines."¶

Ancestral Species. Fossils of many species which resemble man have been unearthed at various places. These fossils instead of providing answers have only raised more questions. The species described below may be regarded as plausible links in the chain of human descent but nothing more.

Ramapithecus (*Rama* symbolic of India and *pithecus* meaning ape) is the earliest man-like primate discovered so far. Ramapithecus lived towards the close of the Miocene age (about 14 million years ago) and is found distributed over a wide area in Eurasia and Africa.

Australopithecus (*Austral*=southern, *pithecus*=ape) was first found in 1924 in Botswana (S.Africa) by Prof. Dart. It was the skull of a child and nothing could be deduced from it about adult specimens. In 1936 Dr. Broom discovered adult fossils of the same species from Transvaal. Both types had brains comparatively bigger for their size than that of the purely anthropoid ape. The Australopithecus walked erect on two legs and apparently used some sort of tools. According to Paul R. Ehrlich and Richard W. Holm, "these men who may have made their appearance in the upper Pliocene (1.75 million years ago) and who disappeared some 500,000 to 600,000 years ago were fully erect and bipedal and made and used stone tools".

Homo Erectus or the erect man was originally called *Pithecanthropus erectus* (the erect ape-man). The name *homo erectus* was given later, when it was found that homo erectus was more of a man than an ape. He is probably the first specie, who represents the final divergence of man from ape.

Homo Erectus compared to the Australopithecus, was a much better walker. He had a larger brain but it was still smaller than that of Homo Sapiens, the modern man. From what is known of him, he was almost chinless with a very broad flat nose, a sloping forehead and massive brow ridges.

The Human Revolution. According to Charles F. Hockett, the Homo Erectus represents our earliest truly human ancestors. He says, "As soon as the hominids had achieved upright posture, bipedal gait, the use of hands for manipulating, for carrying, for manufacturing generalised tools and language, they had become men. The human revolution was over".

"The species Homo Erectus lived at some time during the Middle Pleistocene apparently in a tremendous territory extending from Java and China to Europe, North Africa and may be to South Africa"†. This species was the first to achieve what may be called the **Homo Erectus Complex.** This consisted of six items., 1. Achieving prelanguage, 2. developing a striding gait instead of a shuffling gait, 3. successfully venturing out into open savanna or grassland, 4. engaging in more extensive and effective hunts with more co-operation, 5. developing more advanced carrying techniques, and 6. beginning to lose their hair.¶

¶ Man in Process. p. 16.

† Charles F. Hockett

The constituent features of the erectus complex did not appear overnight in any single hominid community. Each emerged in many successive steps, some in one community, some in another. Gene flow (the flow of gene from parents to offspring) brought them together. In due time then some communities had achieved all the features of the complex while many others had only some of them or even none at all.¶

The culture of this species showed complicated manipulation of tools which favoured expert use of hands. Their clothing was mainly intended as carriers but it also gave them protection from cold, whenever necessary. The use of fire for warmth at night and also for scaring away nocturnal predators appeared as early as 1 million years ago. This is attested to by a discovery at Nice on the Mediterranean coast of France. But the next clear evidence pertains to a period 450 thousand years ago at two widely separated sites as Hungary and North China. Cooking must have been the next natural step and is more or less contemporaneous with improved uses of fire.

The major species of this group were: 1. the Java man first discovered in 1891 in Java by Dr. Dubois, 2. the Pekin man first discovered near Peking in 1926 by Zdansky, an Austrian anthropologist and 3. the Neanderthal man discovered in Neander valley in Germany in 1856.

Homo Sapiens. The next turning point in evolution came around 50,000 years ago, in the warm interval when the ice was retreating in the Pleistocene age. Around this time, a new type of man, the *Homo Sapiens* (thinking man), began to crop up here and there in the form of various successful mutations. By this time, says Charles F. Hockett, "the genus Homo consisted of a single, tightly connected, widespread but highly diverse species. All non-striding hominids were long gone. All surviving hominids were heirs to the full erectus complex. The brain had grown approximately to its present size with some variation in average mass from one population to another".

The sapiens complex as it emerged showed four distinctive features: 1. a more efficient brain, 2. true language, 3. a flat face, and 4. exploitation of the kinds of articulatory motions that are now universal.

The new complex emerged within the framework of the erectus complex and did not undo any of its advantageous features. But it was a new key complex and gave rise to a new adaptive radiation, the second phase of human radiation. The sapiens complex spread just as the erectus complex did—by migration and gene flow.* The tempo, however, was almost unbelievable. The complex bestowed upon those who attained it an unprecedented capacity to co-operate, to move, to improve technology, to adapt and to absorb or eliminate less gifted competitors. By about 40,000 years ago, there was no surviving group of hominids anywhere (with the possible exception of the Neanderthals) who had not absorbed the improved techniques. The Neanderthals persisted in Europe for many years after the sapiens complex became established. This tells us that the sapiens complex did not arise in Europe. But neither do we know where the sapiens complex originated. The Neanderthals lacked the flat baby face that had appeared elsewhere (among the sapiens) and their brains averaged somewhat larger than our own today or that of the Old World contemporaries of the Neanderthals.

Some years ago it was thought that two specimens we had recovered from Europe (Combe Cappelle and CroMagnon) represented the first homo sapiens. This is now seriously questioned. None of the fossils we have so far unearthed can

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Homo Sapiens Sapiens

The biological species of modern man was originally called **homo sapiens** *(thinking man). In recent years an extra* **sapiens** *has been added by some anthropologists. They think that the Neanderthals were a sub-species of homo sapiens and have accordingly named them* **homo sapiens Neanderthalensis.** *This makes the Neanderthals the ancestors of the modern man. Though this view is not accepted by all anthropologists the name* **homo sapiens sapiens** *has become necessary to distinguish the modern man from the Neanderthals.*

Source: Scientific American.

¶ Ibid

* See Ethnology, infra.

qualify as the fossils of the homo sapiens. This means that for the present, this rung (the transition from homo erectus to homo sapiens) has to be treated as missing from the evolutionary ladder.

Whoever the first homo sapiens was or wherever he made his debut, it is clear that once on the scene, the homo sapiens stayed to rule the roost. He appears to have either eliminated or absorbed other species of hominidae, so that he has remained the dominant and the only type of man ever since.

Homo sapiens is most notable for his extremely rapid cultural advances. He improved upon the tools his forbears had left and created new ones, more efficient and sophisticated. He mastered the art of abstraction and the power to retain and reproduce images, long after the originals had disappeared. This led him into painting and sculpture. He had an active awareness of the supernatural and practised some sort of religion. He loved beauty and delighted in adorning himself. He laid the foundations on which our modern civilization is built.

40. ETHNOLOGY

Ethnology is the science of human races. It is part of a much wider discipline, Anthropology. Anthropology deals with man as a biological species and covers all aspects of human life, evolutionary, physical, social, psychic and cultural.

Anthropology is one of those sciences that have undergone a thorough overhauling in the 20th century. Ethnology in particular has been practically re-written.

Old Anthropology. Blumenbach, the father of physical anthropology, divided mankind into 5 races on the basis of colour —white, black, brown, yellow and red. This superficial classification was replaced later by a more sophisticated classification based on physical measurements, or *Anthropometry*. These included measurements of stature, shoulder width, and the length and breadth of the head. The head or skull measurements were worked out as cephalic or cranial index, that is breadth expressed as a percentage of the length. Long heads with low cephalic or cranial index (below 76) were termed *dolicocephalic* or long-headed and those with a high index (above 81) were termed *brachycephalic* or broad-headed. Noses were similarly classified as leptorrhine (long-nosed), chammaerrhine (broad-nosed) or mesorrhine (medium-nosed).

On these and other bases mankind was divided into 3 primary races *Mongoloid*, *Negroid* and *Caucasoid*. Mongoloids are round-headed with broad jaw bones, straight black hair, sparse body hair and yellow to brown skin. Typically, they have an extra fold of skin in front of their eyelids (the epicanthic fold) which gives the impression of their having narrow or even slanting eyes. Negroids are long-headed, woolly-haired, and have protrusive jaws. Their skin ranges from light brown to black. Caucasoids have straight or wavy blond to black hair, skin fair to dark brown and eyes blue, grey or brown. Each of these primary races have a number of secondary races like the Aryans, Dravidians or Alpines. Over and above these primaries and secondaries we have a number of composite races which have mixed characteristics like the Bushmen of Africa, the Aboriginals of Australia or the Maoris of New Zealand.

This kind of classification was not only based on wrong premises but was also random and arbitrary. Thus the tallest and blondest people were called Nordics, no matter where they lived or what their common features were. The squattest and the roundest-headed were regarded as Alpines and the swarthiest as Mediterranean. If a man was so uncooperative as to be short, blond and roundheaded he was said to be the result of race mixture, even if his whole family for generations had the same combination of traits.

Human Species. *Homo Sapiens* is a single biological species. A biological species may be distinguished as a group which cannot interbreed with any species outside it. In the words of Prof. Dobshansky "mankind is a clear-cut, discrete, and closed genetic unit.".

One of the most remarkable features of the human population is its endless variety. Among 4 billion or so of humans we find no duplicates except in the case of identical twins (as distinguished from fraternal twins). Each person is biologically unique and is dissimilar to others. This uniqueness is the result of heredity which every person inherits and the environment in which that person grows up or develops.

As Ashley Montague says, "all varieties of man belong to the same species and without doubt have the same common ancestry. This is a conclusion to which all relevant evidence of comparative anatomy, hematology (science of blood) and genetics points."

Environmental Adaptations. Many physical characteristics of a population are simply adaptations to environments. If there is a change of environment, as it often happens in migrations, the physical traits are also liable to change. As Dobshansky says, "No gene complement is the paragon of adaptability superior in all environments". So it is quite likely that the genes unfavourable to the new environment will by a process of Natural Selection be eliminated and the formation of favourable genes will be promoted. The colour of the skin, the colour, quantity and texture of the hair, as Carleton S. Coon says, "now seem to be very poor criteria" for determining races. Similarly the cephalic index has also been found to be unreliable. R. L. Lehrman says, "In one study it was found that the children of long-headed Sicilians living in New York were more roundheaded than their parents, the cranial (cephalic) index having increased from 77.7 per cent to 81.5 per cent. By contrast, the children of round-headed Jews grew up with longer heads the change being from 83.0 per cent to 81.4 per cent. If the cranial index can show such variation in the space of just one generation how can it be condsidered a hereditary racial trait?"

It is easy to assume but difficult to prove that the existing race units of today are evolutionary genetic units. Ehrlich and Holm say that there is no basis for assuming without extensive genetic study that any population or racial group is an evolutionary unit. Besides, no group ever evolved in isolation from all other groups. Hiernaux says, "Mixtures occurred many times at many places between the most varied population brought into contact by human mobility. The tendency toward high adaptive specialisation was balanced again and again by migrations and by man's power to transform his environment. Even if we could reconstruct the intricate succession of mixtures that contributed to each living population, the final picture would look like a network more than a tree...and a network defies subdivision." (Hiernaux, quoted by Gloria A. Marshall).

Myth of Race. At first, it was assumed that mankind at some remote point of time consisted of a number of highly uniform or pure races and that the diversity we see today is the result of interbreeding. Modern anthropologists reject this thesis. They say that the very idea of a pure original race is more fanciful than real. To take an example, the pure Nordic race of Northern Europe was described as having blond hair, fair skin, blue eyes, tall slender bodies and thin lips and noses. "The fact is", says Robert L. Lehrman, "that there is no evidence that there ever was a race of people in northern Europe who were uniformly blond, blue-eyed, tall and handsome. Today even in the northernmost part of Europe, which is the home of the Nordics, less than half the people are blond. Of this, many are short or brown-eyed, curly-haired or thick-lipped. This has always been the case."

In fact, the so-called pure races are nothing more than a particular combination of traits selected by the anthropologists from a highly variable population. Says L. C. Dunn, "Racial types or natural types are abstractions that form in the mind but do not exist in Nature." R. L. Lehrman is no less outspoken when he says "The pure races of man's past are a myth and nothing more."

Nor are any particular traits the monopoly of any one race. "Almond eyes are found in the classic Mongoloids and in the Bushmen who hardly resemble each other in any other way. Black skin is found in straight-haired people in India, in curly-haired people in Australia and frizzly-haired people in Africa. The tightest frizzled hair is found combined with yellow skin in Bushman-Hottentots. Rh-negative blood is fairly common among Caucasoids, rare among Negroids and almost unknown elsewhere."

Modern Conception of Race. "Race in popular usage," says L. C. Dunn, "is a word with many shades of meaning and connotations and has become so emotionally loaded that some scientists would like to do away with it altogether in referring to human groups. But to the evolutionary biologist it has a clear and unambiguous meaning. A race is a population which differs from other populations in the frequency of some of its genes." The biological conception of race is thus flexible and relative and not fixed and absolute. We put together as members of a race populations which have many, perhaps most, of their genes in common.

"Owing to geographic and social factors," says Theodosius Dobshansky, "mankind is divided and subdivided into a multitude or overlapping and criss-crossing Mendelian populations." A Mendelian population is a reproductive community of individuals who share in a common gene pool. The boundaries between these populations are often, even as a rule, both blurred and shifting in time and space and yet the gene pools of the populations usually differ in the relative frequencies of certain genes and sometimes also qualitatively...The variability of the human populations is not static. Populations, tribes, communities, classes, castes and races expand and contract, emerge and disappear and change in composition in various ways." (Dobshansky).

It is obvious that mankind was and is heterogeneous and that the separating lines of the different kinds are neither clear-cut nor rigid.

Genotype & Phenotype. A person inherits genes from his parents in equal proportions. These determine his individual traits. These traits are moderated by the environment in which he grows up. The totality of genes inherited by a person constitutes his *genotype.* The development or growth of this genotype is neither completed in the womb, nor concluded at birth. The development goes on through life from infancy to adolescence, from adolescence to maturity, from maturity to senility and ultimately to death. The sum total of the observable characteristics of the genotype through all these stages is termed his *phenotype.* The genes interact with the environment and the outcome is the process of development or aging. Development results in an orderly succession of phenotypes. The genotype determines the reactions and responses of the developing or aging organism to the environment: it determines the norm of reaction" (Dobshansky).

In what respects and to what extent the genotype influences the environment or is influenced by the environment and is thus modified, can only be understood by an extensive investigation into the genotype inherited and the phenotype evolved. Prima facie, some factors are determined by the genotype and some by the environment. Thus a person's blood group is obviously determined by his genotype, whereas the language a person speaks is clearly decided by the environment.

Blood types. Studies of known frequency distribution suggest that there is some relationship between the environment and the incidence of certain genes. Blood type studies have yielded a good lot of data in this regard. There are many blood group systems—the ABO, the Rhesus, MNS, etc. The ABO system is the earliest to be discovered and studied.

The ABO system involves three genes, A, B & O. Every person inherits two of these genes from parents. So the genetic structure must be one of the following:- AA, AO, BB, BO, AB and OO. Most populations are a mixture of persons with O, A, B and AB Bloods†. But wide variations are seen in distribution. American Indians of Central and South America are exceptional in being almost uniformly O; Australian aborigins and North American Indians have O and A but no B or AB. The B gene is most frequent in the heartland of Asia and in India. The gene for A, on the contrary, is more frequent in Europe than in Asia or Africa.

Stature. The stature of a person, it is believed, is determined by his genes or genotype. But it is found that the children of Japanese immigrants born in the United States are taller than their parents born in Japan. The environment is clearly responsible for this variance in stature. Thus, the genetic component of a population can be modified by the environment. It is, however, difficult to ascertain how far heredity has influenced the environment or how the environment has influenced heredity. "After all", says Jerry Hirsch, "heredity sets the limits but the environment determines the extent of development within those limits."

Geography & Culture. "The races of *Homo Sapiens,"* says Bently Glass, "whether we lump them into a few or split them into a great many, are clearly of geographic origin". The geographical environment is thus the prime factor in the formation of different races. The geographical environment affects our culture too. The Eskimos know how to kill a whale but not an elephant. An Indian or an African may know how to kill an elephant but he would be utterly flabbergasted when confronted by a whale. In the same way, our dress, food habits and such other things which form part of our culture are always adjusted to conform to the physical environment. We may even set out to alter the environment to suit our needs, for example, by cutting down forests for agricultural purposes.

Culture is an extra—biological method of adaptation. It interacts with our heredity and environment in complex ways. We may achieve adaptation to our environment through 'learned' or conscious responses, instead of by our instinctive reactions. Such 'learned' adaptations are clearly cultural in origin.

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† There are no AO and BO bloods because the O gene is recessive to both A & B genes.

Culture and Physiology. Culture is a property of the whole population, not of an individual. Language, that universal glue which holds cultures together, has no meaning for an isolated person. Unless somebody taught him to speak he cannot even talk to himself. It is now becoming increasingly clear that physiological features characteristic of a human population may be produced by their culture.

Take over-bite, for example. Most human populations have developed over-bite, that is, the upper incisors come down over the lower ones when the mouth is closed. But in modern Eskimos the incisors meet edge to edge in the closed mouth, as it did in our remote ancestors*. This peculiar characteristic of the Eskimos was long treated as a racial feature. Today, however, we see that young Eskimos have developed over-bite. The difference between over-bite and edge-bite is caused by the different ways in which the teeth are put to use, while they are developing. If the front teeth (the incisors) are used to grasp food while cutting it, the new molars when they erupt from the gums will settle into a position that allows the incisors to meet edge to edge. On the other hand, if the food is soft and there is no need for cutting it, the cusps of the baby teeth will not wear down and the upper incisors will grow down on the lower ones and force them back.

The Dinaric race found in south eastern Europe was for many years considered a separate race. Their distinguishing feature was an unusual flattening of the back parts of the head. We now know that this flattening is produced by the custom of swaddling the child flat on its back with its head against the cradle for the first year of its life. It was thus found that the so-called Dinarics are not very different genetically from the rest of the south east European population.

Culture and Intelligence. If physiological features are misleading pointers to racial types, what about intellectual capacities? Isn't it true that some races are intellectually inferior to others—the American whites and Negroes, for instance? This claim has been made on the basis that in intelligence tests the American Negroes showed themselves to be far inferior to the Whites. It is clear that the American Whites and Negroes have quite different cultural backgrounds. Says R. L. Lehrman, "We cannot compare the abilities of two people from different cultures. The usual intelligence tests are worse than useless. All we can say for sure is that our (United States) society creates cultural pressures that keep dark-skinned people at lower levels. This applies only to averages; there are a great many highly accomplished Negroes as well as many whites of low intelligence, culture and skill. The difference between the averages of the two races is far less than the difference within either race. We are not likely ever to know whether there is a racial difference in innate capacity. We already know that if there is one, it is small. The difference would be detectable only if the two races were exposed to the same physical and cultural environment."

Ashley Montague and Theodosius Dobshansky adopt the same view. They say, "The evidence, as we know it, indicates that all human groups possess all the gene potentialities that all other human groups possess but that there are differences between the groups in the manner in which such genes or potentialities are both distributed and environmentally conditioned. If genetic differences exist and we are far from certain that they do, then as between one group and another they must be very small and insignificant indeed."

Formation of Races. Race, as Ernst Mayer points out, "is a population problem", that is to say, the term 'race' applies only to populations not to individuals. The difference between populations is clearly a matter of degree, not of kind. Says L. H. Snyder, "Human populations differ genetically one from the other almost entirely in the *varying proportions* of the genes..and not in the *kinds of genes* they contain."

"Race differences", says Dobshansky, "are facts of nature which can, given sufficient study, be ascertained objectively. Mendelian populations of any kind, from small tribes to inhabitants of countries and continents, may differ in the frequencies of some genetic variants or they may not, If they so differ, they are racially distinct". Though the general tendency of races is, as Dobshansky says, towards convergence, it does not mean that mankind is evolving towards a single superior race. "Purity, fixity, uniformity", says L. C. Dunn, "never seem to be the goals in human evolution".

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* The edge-to-edge bite prevailed in England till the 11th century A. D.

Race, in other words, is not an immutable biological entity fixed for all time. Every one of the so-called races of today is in a state of flux, changing and changeable from day to day. Some races like the Negritos or Bushmen are "relics of ancient populations which were more widely distributed in the past than they are at present. Some of them are being submerged and assimilated by intermarriage with their neighbours or becoming extinct. ....New races....still in formative stages, their gene pools not clearly separated from those of their neighbours, are still without internal coherence" (Dobshansky).

Mutation. The major factors that operate in the evolution of races are three: *Mutation, Natural Selection* and *Gene Flow*. Mutation is a change in the structure of the gene itself. Such a change can be favourable or unfavourable to the species. We say a mutation is favourable when it helps the species to fare better in the struggle for survival. In the early human communities the chances of a favourable mutation were quite limited because the communities were themselves very small. "Today, on the contrary, our breeding populations are so large that any favourable mutation is quite likely to arise in every population frequently....In a population of 100 million individuals a mutation with frequency of 1 in a million will arise 200 times per generation" (Bently Glass).

Natural Selection is another process by which Nature intervenes in evolution. All populations have the same chance for a mutation—around one in a million. But whether or not a new gene produced by mutation remains in the population after its first appearance depends on the action of other evolutionary agencies like Natural Selection. If the new gene is favourable to the species, natural selection will operate to promote the reproduction of such persons who carry the new gene and reduce the reproductive rate of others. Thus the next generation will contain a greater number of persons who carry the favourable gene. Similarly carriers of unfavourable genes will have their productivity lowered so that succeeding generations will contain fewer members carrying the unfavourable genes.

This is only one of the many ways in which Natural Selection operates—perhaps, the most obvious. There are many other ways in which Natural Selection can intervene in the fortunes of a race. But its processes are mostly obscure and take many years to make themselves felt. Two things, however, are clear. 1) The selection pressures operating in any one population need not be the same as those operating in another population. 2) The processes will also change as time passes and environmental conditions change. Our most primitive human societies depended upon the number of healthy adults for survival. In those days fertility and powers of endurance were crucial. So selection concentrated on producing as many sturdy adults as possible. Today numbers have become a liability. The emphasis now is on the economic viability of a population, not on its fertility.

Gene Flow means the flow of genes from parents to children. This has a great impact on evolution when inter-breeding takes place between two races with different gene pools. History is replete with such inter-breeding. Thus the gene pool of North American Negroes is now approximately 30 per cent derived from white ancestry. In South America the amalgamation is considerably greater. The original races in S. America are in fact disappearing, though it may take thousands of years before a new biological group is evolved.

When two persons of different races marry, the children inherit half their genes from one parent and the other half from the other parent. A new gene pool is thus created. This is stirred up and re-aligned every generation. So within a number of generations a new race may show up with a constellation of genes widely different from those of the original parents.

41. THE NEW BIOLOGY

The New Biology, technically known as *Molecular Biology*, is a revolutionary development. In the way it has upset conventional ideas, it resembles the Plate Tectonics theory in geology. In its complexity and range, it challenges comparison with the latest advances in astrophysics. Here, physics, chemistry and biology have joined hands to unravel the mysteries of life.

The name *Molecular Biology* is derived from the fact that the new biology deals almost exclusively with biological molecules—mostly protein molecules. Molecules are the smallest particles of matter that can exist in a free state. They are themselves composed of still smaller particles called atoms which again are the smallest particles of an element. With the splitting of the atom and the discovery of sub-atomic particles, physics has opened up a new world of highly intriguing phenomena. This had the indirect effect of degrading the molecule as an insignificant concept. The new biology has reinstated the molecule. The molecules have now become highly significant units which have opened up another new world, as awesome and complex as the sub-atomic world. This is the world of the cell, the smallest unit of life.

The Cell. The cell is the smallest unit of life that is capable of independent existence. It occurs in all living organisms, plants, bacteria, insects, animals and men. The average diameter of a cell is between $\frac{1}{50}$ and $\frac{1}{100}$ millimetre. Some cells are even smaller, about $\frac{1}{200}$ mm. The largest human cell is the *ovum*, which is just visible to the naked eye. No other human cell is visible without a microscope. The molecular composition of the cell itself and the endless range of protein molecules that the cell synthesises, form the subject matter of the *new* (molecular) *biology*.

The smallest living organism (the bacterium) contains only one cell. As we go higher up the biological ladder the number of cells increases manifold. In man, the number goes up to a hundred trillion (100 followed by 12 zeros) or more. Every square inch of our skin contains about a million cells. The brain is made up of some 30 billion cells (30 followed by 9 zeros). Our blood contains about 20 trillion. They are so small that it would take about 30,000 of them to fill an area of one sq. mm. Cells are found in different shapes. Some are spheres, some are rectangular and some others spirals. Some have tails and some (nerve cells) are star-shaped with wispy arms, several feet in length.

The human cell is the result of billions of years of evolution. Its structure is so complicated and the varieties of proteins it produces so numerous that it is a world in and by itself—a micro-universe, containing many minute bodies functioning in unison. These miniscule bodies can operate in time limits as small as thousandths of a second and in perfect tune with the biological rhythm which it has inherited from its remote ancestors in the primordial ocean. Every little movement of our body, every breath that we take, the wink of an eye or the curl of a lip is the ultimate result of the activities of millions of cells in different parts of the body, functioning with split-second precision.

Each cell appears to be a blob of jelly filled with tiny molecular structures. Even the largest of these molecules like the DNA is measured in microscopic units called *angstroms*[†] $\frac{1}{250,000,000}$ of an inch. The whole cell is surrounded by a fine but strong membrane—the *cell membrane*—which is only 500,000th of an inch in thickness. The cell has a dense kernel called the *nucleus*, which controls the activities of the rest of the cell. Outside the nucleus, the cell is filled with a gelatinous substance called *cytoplasm*, which contains various bodies, collectively called *organelles*, which are themselves enveloped in thin membranes of their own.

Every cell has a complicated calendar of its own—when to grow, when to divide and when to die. Of course, all cells of the same type follow the same routine and observe the same timetable. The cell shows the maximum activity when it divides and multiplies. The cell division is itself a strictly controlled activity. A human cell in a laboratory (that is, outside the bodily environment) divides some fifty times before dying. This seems to be its maximum rate of reproduction and maximum span of life. (This is a logical guess not a proved fact.) Of course, all cells do not divide fifty times. Each cell follows the programme laid down by its genes. If all our cells divided fifty times we would reach gigantic proportions and may weigh in trillions of tons. This is one reason why the division and multiplication programme is kept under strict control.

[†] See S. 2.

Every cell contains the entire repertoire of genes for that plant or animal. That is to say, every cell in the body, no matter where, has the potential capacity to differentiate into various organs—hands, feet, heart, liver etc, so as to create a complete individual of the species. It is this capacity of the cell that has made *clones* possible (see infra).

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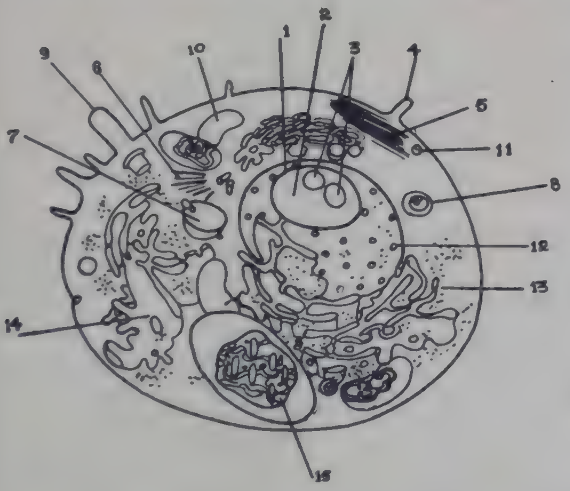
The Cell

We are by weight 70 per cent fluid, the same percentage of the earth's surface that is covered by the oceans. The sea within us has the same saltiness as the pre-Cambrian seas of 3 billion years ago. It is thought that life originated from the saline broth that the pre-Cambrian seas supplied. As a foetus, man has to spend his first months in a sac of saline solution in the uterus. After birth, the human cells—not the human body as a whole—float in a similar sea of fluids. It is from these fluids that the cell draws its nutrients and the raw materials necessary for protein synthesis. The covering of the cell—the cell membrane—allows in and out passage to proteins and other materials.



1. *The Nucleus, the core and controlling centre of the cell. It is enclosed in a thin but strong membrane called the nuclear envelope.*
2. *The Chromosome is a package of DNA molecules divided into hundreds of genes. It carries our inherited traits and contains the master plan for building the body.*
3. *The Nucleoli, which contain concentrations of RNA.*
4. *Microvilli are protrusions on the outer surface of the cell. These enlarge the surface of the cell and increase its absorption.*

5.&6. *Micro-filaments (5) and microtubules (6) form muscles of the cell.*

7.&8. *Organelles which do scavenging work of the cell. They digest and consume not only foreign matter but also dead parts of the cell itself.*

9. *Ceilia which are found in large numbers on certain cells function as oars, which direct the movements of the cell.*
10. *Mitochondria are bean-shaped dynamos which provide energy for the cell by burning fats and sugars.*
11. *Pinocytosis vesicles which act as porters to carry materials from the surface to the interior.*
12. *Pores on the surface of the nucleus enable substances to pass to and from the nucleus.*
13. *Ribosomes are small dark particles that congregate in the cytoplasm. They are the anvils on which proteins are made according to RNA directions.*
14. *The Endoplasmic Reticulum (ER) is a system of interlocking channels which transport cell products.*
15. *The Chloroplast which occurs only in plant cells carries on photosynthesis.*

The Nucleus. The nucleus of the cell contains the master plan for building up a full specimen of the species. The master plan is contained in the fibres of the protein-laced DNA called *Chromosomes*. Each chromosome is a package of DNA divided into hundreds of *Genes*. Genes, for specific physical features like blue eyes or curly hair, are located at specific points on the chromosomes. It is from these chromosomes that the genes send out the necessary instructions for the production of proteins or other activities of the cell. Another important body in the nucleus is the *nucleoli* which contain concentrations of RNA. The nucleus with its chromosomes and nucleoli is encased in a thin membrane called the *nuclear envelope*.

Cytoplasm. The cytoplasm is reinforced by bundles and strands of fibres. These *microtubules* and *micro-filaments* form the muscles of the cell. They keep up the structure of the cell and, when necessary, help in pulling apart dividing cells. The cell membrane is covered with protrusions called *microvilli* which enlarge the area of the cell surface and promote increased absorption. The rim of the nucleus is guarded by globules called *lysosomes* which cruise around the cytoplasm and combat alien intruders. Lysosomes are sacs of corrosive enzymes that can digest almost anything. They also function as sanitising agents which keep the cell clean by destroying worn out cell parts and spent enzymes. For instance, when a tadpole turns into a frog, it is the lysosomes that eat up the tail and eliminate it.

The cytoplasm contains the power system of the cell. These are the bean-shaped dynamos called the *mitochondria*. The mitochondria appear to have been alien bodies in the first instance. They were caught up by the cells in the course of evolution many millions of years ago and have since been used by the cell to provide it the necessary power. The mitochondria produce energy by burning fats and sugars and store it in the form of ATP (adenosine triphosphate) molecules (see *Biosphere* infra). An active cell requires more than 2 million molecules of ATP a second so as to drive its biochemical machinery. Cells that consume great quantities of energy like those in the wing muscles of birds or in the flagella of a sperm contain thousands of mitochondria.

Among other important parts of the cell, the *Endoplasmic Reticulum* and the *Ribosomes* call for special notice. Endoplasmic Reticulum or ER is a scaffold of inner membranes with a system of interlocking channels through which the cell transports hormones, enzymes and other compounds produced by it. Ribosomes are found as small dark particles congregating in millions in the cytoplasm. They serve as tiny anvils on which the cell mixes proteins in the required patterns. The proteins thus assembled in the ribosomes are passed through the channels of the ER. Some proteins need further processing. This is done by the channels in the ER. When the proteins are ready, they are packed into a membrane called *secretion granule* and carried to the surface of the cell, from where they are expelled for use by whatever organs of the body which require them.

Chloroplast. The chloroplast is unique to plants. Animals do not possess this chemical. Neither do they want it. But for the plants it is quite essential. Chloroplast does the same work for plants which the mitochondria do for animals. It uses the rays of the sun to cook the food necessary for plants from carbon dioxide and water. This cooking process is called *photosynthesis* which provides the plant cells with ATP. Incidentally, it also provides the atmosphere with oxygen (see *Biosphere* supra).

Cell Triggers. The cell is equipped with a number of triggers which give signals for any operation to begin, continue or stop. The cell has a whole range of signals, green lights, red lights, amber lights. The *repressors*, for example, switch off unnecessary or undesirable activities of any of the cell molecules. Similarly the *inducers* switch on the cell mechanism to start any activity. Two of the most important of such triggers are the *Receptors* and *Recognition molecules* The receptors are protein molecules floating in the cytoplasm. They put out branching antennae with which they sense the environment outside the cell and transmit messages to the nucleus. This happens every time something impinges on the sensitive antennae. Thus, it is the receptors on our taste buds (cells) that make us aware of the qualities of the food we eat. If the food is unpalatable the receptors trigger responses that make us spit out the food.

Recognition Molecules. Perhaps the most important of all cell triggers are the recognition molecules. These molecules move about on the surface of the cells. They are the markers of our individualities and enable us to retain our identities as specific individuals of the species. Our blood types are grouped as A, B, AB, or O according to the behaviour of the recognition molecules on our red blood cells. Many transplant patients reject other people's hearts or kidneys mainly because the patients' recognition molecules consider the transplants as foreign bodies and trigger responses to raject them. What happens here is that the recognition molecules fail to identify the transplants as friendly helpers who have been brought into the body for its own survival. Instead, they consider them as illegal trespassers and signal the body to throw them out. A more important, if less evident, function of the recognition molecules is to find out for what particular cells, particular molecules, say a hormone, have been synthesised and to direct them unerringly to their destinations or target cells. This is a most complex and complicated task. Thousands of protein molecules are produced by millions of cells in one part of the body for far off cells in other parts. How to get these innumerable molecules—each to its own destination—without getting them mixed up is a task before which the best minds may quail. And yet it is carried out by the recognition molecules, as a routine job. Thus all our bodily processes, from heart beat of which we are hardly conscious to hunger which is acutely felt, are in the last analysis determined and regulated by our recognition molecules.

The selective capacity of the recognition molecules enables us to maintain our biological individuality. These molecules direct the cells to absorb or otherwise accommodate cells of their own kind, to resist or destrory inimical cells and to expel or leave alone cells that can neither join the bodily organs nor become dangerous to them.

This mechanism is most important to the organism in its fight against invading bacteria. Here, the recognition molecules play the dominant part. They are in fact the corner-stones of our immune system. If dangerous foreign intruders appear, the recognition molecules alert the cells threatened and signals go out to the entire immune system to be on its toes to launch a counter attack. The intruding molecules called *antigens* are also protein molecules. They are brought in mostly by microbes and are quite often different from the body's own proteins. The presence of antigens in the system provokes the body to produce *anti-bodies*. An anti-body is the body's own protein produced in response to a contamination by an antigen. These anti-bodies summon to their aid other protein molecules of the body like the *macrophagus* and the *lymphocyte*. Acting in concert they often succeed in liquidating the antigens without our being aware of the pitched battles that are often fought. It is when these anti-bodies and their allies lose to the invaders that we go down with one disease or another and seek the help of doctors. But even when these anti-bodies lose, our immune system retains clear memories of the battle with the invaders. These enable the system to be better equipped to resist or destroy the same and sometimes similar antigens in a fresh invasion. It is this process that gives us immunity from any particular disease or diseases to which we have once succumbed.

Allergy. Allergy is, in a sense, a misdirected activity of the immune system. It is the body's reaction to foreign proteins which do not otherwise harm the system. It is curious that the antigens which provoke allergy are not always proteins. They include drugs and chemicals and sometimes even simple chemical elements. Such antigens are called *haptens*. The body's allergic reaction to these haptens is often explained by the fact that these haptens accidentally combine with some bodily protein to form a new foreign protein—*allergen*—which brings anti-bodies into play. Whatever may be the explanation, it is clear that allergies bring out the biological idiosyncrasies of ihe individual concerned. Brothers and sisters often differ widely in their allergies. Probably this difference has something to do with genes but how exactly we have yet to know.

Cancer. Cancer is one of those diseases which remain beyond the control of our immune system. Of course, cancer is not one disease but many. There are some 80 kinds of cancer. What they have in common is that they almost invariably by-pass our immune system. Cancer develops when there is an erratic or uncontrolled growth of boby cells. Our control mechanism fails and the cells run wild and go on multiplying, choking the normal cells much as weeds choke a garden.

What has happened to our immune system? Why can't it rise to the challenge? One answer suggested is that cancer cells camouflage themselves by hiding their surface antigens. This misleads our recognition molecules which do not alert the immune system. So the cancer cells are left to grow and multiply merrily.

Some think that the problem of cancer goes deeper than our recognition molecules and surface antigens. It goes to the very root of the organism—the genes. They suggest that cancer is caused by mutations* or change in our DNA, so that a key gene or a group of genes no longer works properly. It is suggested that cancer is caused by a virus that manages to pierce the gene and introduce its own DNA into the cell DNA. Once the viral DNA takes over the cell DNA, the cells go on multiplying but the new (multiplied) cells are viral cells and not the original cells of the organism.

An even more ominous suggestion is that all of us have in our cells genes for an RNA tumour virus which we have inherited from our remote biological ancestors. Normally, these RNAs remain dormant or inactive but now and then they (RNA's) go haywire producing tumour cells that are malignant and uncontrollable.

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* See Ethnology supra.

15

Cancer Culprit

Researchers have long suspected that a virus must be responsible for some forms of leukaemia in human beings, just as it is in many animals. Now, after a twelve-year search, Robert Gallo and his co-workers at the National Cancer Institute are sure they have found such a virus. Their work has since been confirmed by Japanese scientists. Gallo named the culprit the **human T-cell leukaemia virus, (HTLV),** *because it is linked to a rare malignancy that affects the T-cell a form of white blood cell. He discovered the virus only after achieving what other researchers have faild to do; he kept T-cells alive in tissue culture. He found that cancerous T-cells released the virus, which implied that they were infected with it.*

To buttress the claim, Gallo's group has found in some patients with T-cell cancers, the antibodies produced by the immune system to counter HTLV. Identification of these antibodies, which are rarely present in healthy people, should be useful in helping diagnose T-cell leukaemia and lymphomas.

Unlike the DNA viruses linked with certain human cancers, HTLV is an RNA retrovirus. This means that it does not need to kill cells but can somehow use the machinery of normal cells in order to reproduce. The study of this process could reveal a great deal about mechanisms at work in human cancer cells.

Source: Discover, June 1982.

42. GENES*

The whole process of life is masterminded by the genes. The genes are located in the chromosomes which are themselves situated in the nucleus of the cell. The genes, the chromosomes and the nucleus together constitute—to use a famous phrase of Churchill's—"a riddle wrapped in a mystery inside an enigma". The genes form the riddle, the chromosomes represent the mystery and the nucleus the enigma.

DNA and the Genetic Code. Much of the mystery surrounding the genes was cleared up with the discovery of the structure of the DNA announced by J.D. Watson and Francis Crick in April 1953. In structure the DNA resembles a long rope ladder twisted around like a corkscrew. If we straighten the ladder, we shall see that the two sides of the ladder are long chains of two substances—sugars and phosphates—in repeated sequences. These form the backbone of the DNA. Their structure never varies.

The secret of the DNA lies in the rungs that connect the two sides of the ladder. These rungs form two parts or two half-rungs, each half being attached to one side of the ladder. These half-rungs can be one of four types of little molecules: *Adenine (A), Cytosine (C), Thymine (T), and Guanin (G).* Each of these half-rungs together with the attached segment of the ladder is known as a *nucleotide*. A half-rung on one side will only join with a specified partner on the other side. This pre-determined arrangement for specific partners suggested that these little molecules formed the letters of a fixed code or the words of a new language. Indeed, it has turned out that this is exactly what they are.

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* For a full account of genes, their composition and activities, see Special Feature, *Manorama Year Book 1978.*

An *A* will form a rung only with a *T* and a *C* only with a *G*. So, the pairs *A-T*, *T-A*, *C-G* and *G-C* form in a way a four-letter alphabet with which messages can be spelt out. This four-letter alphabet makes up what is known as the *Genetic Code*. The genetic code is not only complex but also extensive. In 1977 Fred Sangar pointed out that the DNA code of a virus, when decoded by the computer came to a print-out of 15 metres. At this rate, the computer print-out for the human DNA would stretch to 16,000 km.

Enormously long strands of DNA intertwine within the core of living cells. So narrow and tightly coiled is this DNA that all the genes in all the cells in a human body would easily fit into a ½ inch cube. Yet, if all these DNA strands are unwound and joined together it would stretch from the earth to the sun and back.

A cell contains many genes. The basic pairs of genes are the ones inherited from the parents, one from each parent. In addition to these, the cell contains other strands of DNA, some of which have no apparent function.

Genetic Activities. The genes control all functions of the cell and body growth. The two main events in the life of most cells are multiplication (by division) and synthesis of proteins. Both these operations are carried out on the basis of the blueprints coded in the genes.

Replication. Before a cell divides, the DNA ladder splits down the middle. The nucleotides *As* separate from the *Ts* and the *Cs* from the *Gs* much in the same way as a zipper is pulled apart. Now, the separated nucleotides A, T, C, and G pick up appropriate partners from the free-floating nucleotides in the cell. Thus the split ladder becomes two whole ladders of DNA, each an identical copy of the other. Once the division of the DNA is completed the rest of the cells, other organelles also duplicate, ultimately producing two cells of the same type.

Differentiation. The replication of cells in growing bodies is followed by differentiation. Life in most species begins from a single fertilised egg or cell. The single cell becomes a double cell, then a quadruple and so on. At the same time different sets of genes work in different cells evolving specific physical traits, while specialised cells form different organs of the body, hands, legs, brain, heart etc. This process is known as *differentiation*. Differentiation implies strictly regulated work. The cells concerned concentrate on the task in hand and cease all other activities and when the work is completed they stop working. This switching on and off of genetic activites is achieved by the presence of two molecules attached to the genes—*inducers* and *repressors*. (see *The New Biology* supra).

Heredity. The genes which we inherit from our parents determine our hereditary traits. Hereditary characteristics are not transmitted in a package, as it were. Different genes are responsible for different inherited traits. Each gene functions independently of other genes in this respect. The genes for a particular trait are found at the particular locations in the chromosomes.

Chromosomes. Chromosomes are thread-like bodies found in the nucleus of the cell. They are always found in pairs. Chromosomes vary in number according to species. The fruit fly, for example, has 4 pairs or 8 chromosomes in all, and the garden pea has 7 pairs (14 in all). Mice have 20 (40) and humans 23 (46). Our 46 chromosomes arranged in single file would measure more than 6 feet. Yet they are contained in the nucleus which is about forty-thousandths of an inch. The nucleus is filled with nucleic acids of two kinds *Ribose Nucleic Acid*, RNA and *Deoxyribose Nucleic Acid*, DNA. The DNA is concentrated in the chromosomes while RNA is seen concentrated in the nucleoli, both of which are in the nucleus.

Protein Synthesis. One of the primary functions of the cell is to manufacture proteins. The human body requires thousands of different proteins. All these are built from 20 amino acids. Each gene (or a distinct segment of the DNA strand) contains instructions for making a specific protein. The instructions are coded into a precise sequence of nucleotides. Just as we can change the meaning of a sentence by re-arranging the words, the genes can spell an immense vocabulary of proteins using only the four nucleotides of the DNA—A, T, C, and G. All the A, T, C, and G in one set of human chromosomes (46 in number) can be put together in billions of different ways. One geneticist, H. J. Muller has estimated that the number of different ways of putting together all the As, Ts, Cs, and Gs would be the figure 256 followed by 2.4 billion‡ zeros. This is a figure that boggles the imagination. It would be a lifetime job if any one sat down to write out that figure in full. Or, just try it.

RNA. In protein synthesis the DNA is assisted by the RNA. RNA is a single strand as against the double strand of the DNA and is different in composition. That is to say, the RNA has *Uracil (U)* in the place of DNA's *Thymine (T)*. RNA is of two kinds, messenger RNA (mRNA) and transfer RNA (tRNA). When a protein is to be prepared the concerned gene opens. RNA (mRNA) nucleotides attach themselves to the gene and go on growing like a ribbon. This ribbon is the mRNA. It carries the code for making the specific protein. Proceeding from the gene inside the nucleus the mRNA moves out into the cytoplasm looking for a ribosome for the assembly of the particular protein. The sequence of As, Us, Cs and Gs on the messenger RNA forms into groups of 3-letter words like *ACU, CGG, CCU* etc. These 3-letter words are called codons.

The message carried by the mRNA is transferred to the transfer RNA. The tRNA proceeds to collect the amino acids, named in the message from the chemicals stored in the cytoplasm and bring them to the ribosome. Here the amino acids are linked together in the sequence indicated by the code and the synthesis of that particular protein is completed.

Genetic Code. The genetic code or dictionary may be visualised as a dictionary of two columns. The first column lists 64 codons or words that represent the chain of nucleotides that comprise the DNA. The second column lists the twenty words that represent the chain of amino acids which make up a protein. Sixty-one of the DNA codons, each three letters long, specify one amino acid each. In many cases several different codons can specify the same amino acid. Three of the sixty-four codons represent punctuation, namely full stop, which tells the protein making machinery to stop. GUU, for example, is the code for the amino acid, valine. UGA is one of the punctuation codes—a full stop.

The codons in the first column represent the nitrogenous bases of the RNA—Uracil (U), Cytosine (C), Adenine (A) and Guanin (G). These show the sequence of nucleotides. The codons in the second column show the sequence of amino acids in the protein, made in response to the DNA message.

The genetic code is not the same for all living organisms. The test here is to see whether the sequences in the nucleotides and in the amino acids tally. Such tests have been carried out in the mitochondria of yeasts, cattle and human beings. The mitochondria are the dynamos which provide power for the cells to function. The code for the mitochondria can be deduced if the codon sequences of mitochondrial *DNA* (the DNA in the mitochondria) are compared with the amino acid sequences of the mitochondrial *protein*.

When such a comparison was worked out for the human mitochondria it was found that the code for mitochondria differed in two respects from the normal genetic code. The codon UGA, normally one of the punctuation codons stood for the amino acid tryptophan in the mitochondria. The codon AUA, normally the codon for the amino acid isoleucine, served as the codon for methionine in the mitochondria.†

Clones. Every cell is equipped with the material and the knowhow to build a full adult of the species. It is therefore possible to reproduce any organism if a living cell from any part of the organism is available. This was proved in the fifties by F. C. Steward of Cornell University. He placed tiny pieces from carrot slices in glass flasks containing nutritive solutions. He revolved the flasks slowly and released free cells from the carrot pieces. These free cells were left to grow by themselves. They grew into complete carrot plants. An English scientist J. B. Gurdon carried out another experiment with frog's eggs. He destroyed the nuclei in the eggs. The frog eggs were then filled with nuclei taken from a tadpole's intestinal tissues. The eggs developed into exact replicas of the donor tadpole. This opens up the possibility of cloning human beings themselves by the same process.

Cloning is asexual reproduction. A male and a female need not unite to produce offspring. But in cloning, a cell from a male will only produce a male and vice versa. This handicap is compensated by the fact that the offspring would be an exact replica of the donor. Science fiction has already started phantasising about cloning a new race of supermen and superwomen.

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‡ See Footnote to S. 59.

†*Source:* Scientific American Feb. 1980.

Genetic Engineering. The discovery of the genetic code has enabled biologists to synthesise artificial genes and to combine genes of one species with those of another and produce a genetic hybrid. These and other manipulations of genes are called Genetic Engineering. The most important development in genetic engineering today is the Recombinant DNA technique. In this, a piece of the DNA from one organism (donor) is introduced into the DNA of another organism (recipient) so that it becomes part of the recipient cell and functions accordingly. (see *Re-Combinant DNA* infra).

43. PLASMIDS*

Plasmids may be regarded as auxiliary genetic units, as opposed to chromosomal genes which are regarded as the primary units. Plasmids are found most commonly in bacteria and less often in the higher organisms. It is part of the cell but not a necessary part, that is to say, a cell can function fully in the absence of the plasmids. But plasmids can function only in a cell. So plasmids are considered subcellular organisms.

Plasmids & Viruses. Plasmids resemble viruses in many respects but are essentially different organisms. Viruses are composed of a molecule of nucleic acid (DNA or RNA) wrapped up in a protein coat. Plasmids are made of double stranded DNA molecules which contain a few genes linked together in a small circle. Unlike the viruses they have no protective protein coating. Another vital point of difference is that while plasmids can reproduce themselves without the assistance of the cell, viruses can only reproduce through the medium of the host cells. But the most important difference between the two lies in the roles they play in the life of the cell. A virus is a predator who uses the host cell for its own reproduction and in the process destroys it. A plasmid, on the other hand, does not harm the cell in any manner. On the contrary, it helps the cell by providing it with accessory genetic traits which the cell's own chromosomal genes do not possess.

Plasmid genes are not basically different from chromosomal genes though they are much fewer in number. Both genes encode for proteins that are active enzymes and both use the same metabolic process to synthesise the proteins. Plasmid genes score over chromosomal genes in one respect. Chromosomal genes can only combine with identical or very similar genes which are their variants (or *alleles*, as they are called). Plasmids can combine their genes with altogether dissimilar genes.

Plasmids are responsible for a wide range of biological activities in bacteria but their most intensively studied attribute is the R factor (Resistance factor) particularly to antibiotics. This is not unique to plasmids since mutation in chromosomal genes can also endow them with Resistance factors. However, since mutations are rare among chromosomal genes, they do not ordinarily engineer such resistance. In plasmids this activity is commonploce.

Plasmids adopt different strategies to immobilise substances which are toxic to them and these include antibiotics. The first strategy is *outright destruction* of the toxic elements. This is what happens to drugs like penicillin, streptomycin and mercury compounds. A second strategy is *blocking* the access of antibiotics to their particular targets in the cell. This is often the case with antibiotics like erythromycin which act by binding themselves to the organelles concerned. A third strategy is a *bypassing* process, that is, substituting an enzyme which does the same function as the antibiotic but is not affected by (remains immune to) the antibiotic drug. This is what happens in the administration of sulfa drugs, trimithoprin and others.

Genetic Variation. When it is seen that bacteria or viruses which initially succumbed to antibiotics subsequently developed resistance, it is clear that some genetic variation must have occurred in the bacteria or virus. Such variations can occur both in the chromosomal and plasmid genes either by mutation, that is a change in the structure of the genes which occurs naturally or by a re-arrangement of the genes. The re-arrangement may take place either by a new gene joining up or by a re-shuffling of the old genes themselves.

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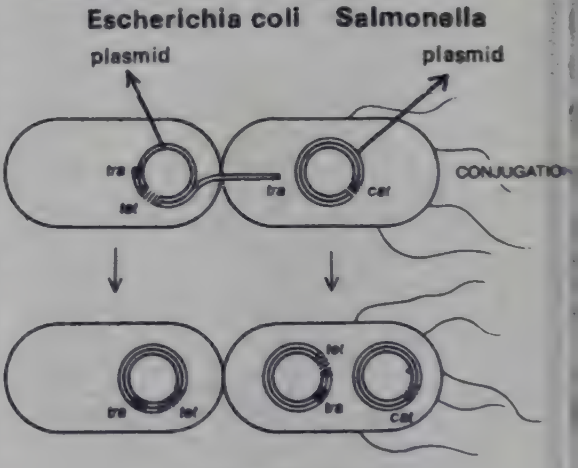
* The name *Plasmids* was given by Joshua Lederberg, an American micro-biologist in 1952. Though the name was at first objected to by many micro-biologists, it was finally adopted for want of a better substitute.

Such a re-combination of genes and consequent genetic variations are universal among higher organisms who reproduce sexually and have many chromosomes and innumerable genes. But in bacteria which possess only one chromosome and which reproduce themselves by simply dividing into two, such re-combinations are neither easy nor common. As the bacteria have only one chromosome, different alleles of the same gene are not normally present in a single cell. The re-shuffling of bacterial genes therefore ordinarily calls for the introduction into the bacterium of DNA molecules that carry alleles from another bacterium. The plasmid genes have an edge over chromosomal genes in this matter. The chromosomal genes can combine with their alleles (variants) only while plasmid genes can combine not only with their alleles but also with entirely different genes. This makes it easy for plasmids to acquire resistance to a number of antibiotics by combining with a number of other antibiotic resistant genes.

There are three ways in which plasmids may effect genetic mixes leading to genetic variations. 1. *Transduction.* This happens when a virus infects a cell and carries fragments of the DNA of that cell into other cells which it infects later. 2. *Transformation.* This occurs when a DNA released by the death of the cell or some other natural process simply enters a new cell by piercing the cell wall. 3. *Conjugation.* This takes place when a cell transfers some of its genes by sending out a tube into the recipient cell. This is the commonest way in which plasmids achieve genetic variation.

As an instance, let us take the common intestinal bacterium *E. coli* (Escherichia coli) carrying a *tetracycline* resistant gene and *Salmonella*, a bacterium associated with food poisoning which carries a *choramphenical* resistant. Coming together the E. coli plasmid sends out a tube into the salmonella plasmid. The tetracycline resistant in E. coli is transferred through this tube into the Salmonella plasmid. This would make the Salmonella plasmid resistant to both tetracycline and choramphenical. In an environment containing both antibiotics, E. coli would die but Salmonella would thrive resisting both antibiotics. (see Illustration).



tra=transmission tube
tet = tetracycline
cat - chloramphenicol

44. RE-COMBINANT DNA

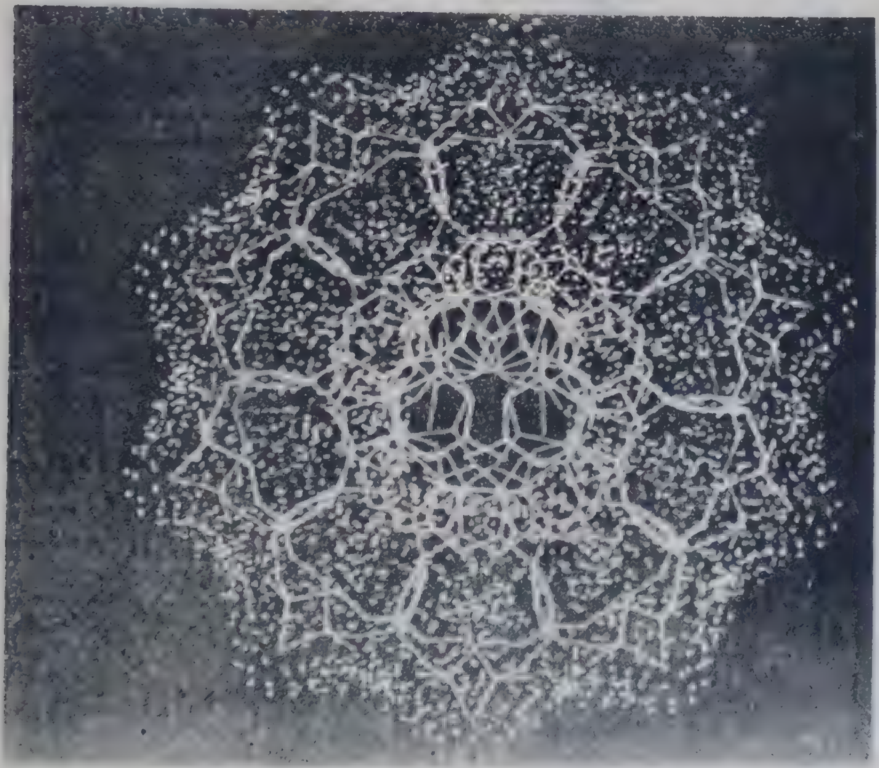
As biologists learned more and more of the genetic code, they started investigations to see if the code can be permanently changed by manipulating the genes. All attempts in this regard have been collectively categorised as *Genetic Engineering*. These include fusions, deletions, inversions and transpositions of genes. The most celebrated of all these attempts is the hybridisation of genes, that is grafting a piece of the DNA of one organism to the DNA of another. Research in this technique, briefly known as *Re-combinant DNA*, was facilitated by the discovery of the plasmids and of certain enzymes. Pioneer attempts in this direction have been so successful that the technique has emerged as a commercial proposition. *Time* writes that this technique promises to be "the technology of the 1980s just as plastics were in the 1940s, transistors in the 1950s, computers in the 1960s and micro-computers in the 1970s".

The technique involves micro-surgery. Precision tools for this surgery are provided by certain enzymes which Paul Berg calls molecular scalpels and sutures. One of these enzymes called Restriction Enzyme can cut the DNA at any specific point required and graft it on to a foreign DNA. The sliced-out gene must have sticky ends shaped like mortises in order to anneal it firmly to the foreign DNA. This is also done by the Restriction Enzyme. Given these conditions it is possible to re-combine DNAs as diverse as those of a bacterium and an animal.

The first successful attempt at grafting a piece of DNA to a foreign DNA was made by Paul Berg of Stanford University. He took his initial supply of DNA from a well known laboratory organism *SV 40* (short for simian virus 40). Its genetic structure is fairly simple with about 7 genes in all, compared to the thousands of genes that crowd the cells of higher organisms. To insert this genetic material into a bacterium, Berg used as his carrier (vector) another variety of virus called the *lamda phage,* which preys on bacteria. The first step in the operation was to cut out a slice of SV 40's DNA molecule. This was done by the use of Restriction Enzyme. As the enzyme cut the double-stranded DNA, it left one strand jutting out at both ends. These were sticky ends and were to be inserted into the foreign DNA which was similarly cleaved with one strand standing out at each end. When the cut ends were put together the single strands joined up to become double strands and the cleavage in the DNA ring was closed up. When this was done Berg had achieved a scientific first—combining the DNAs of two species of virus into a single DNA molecule (see *Fig 1*). Berg shared the 1980 Nobel Prize for Chemistry for this achievement.

Fig 1

A DNA molecule : Cross section



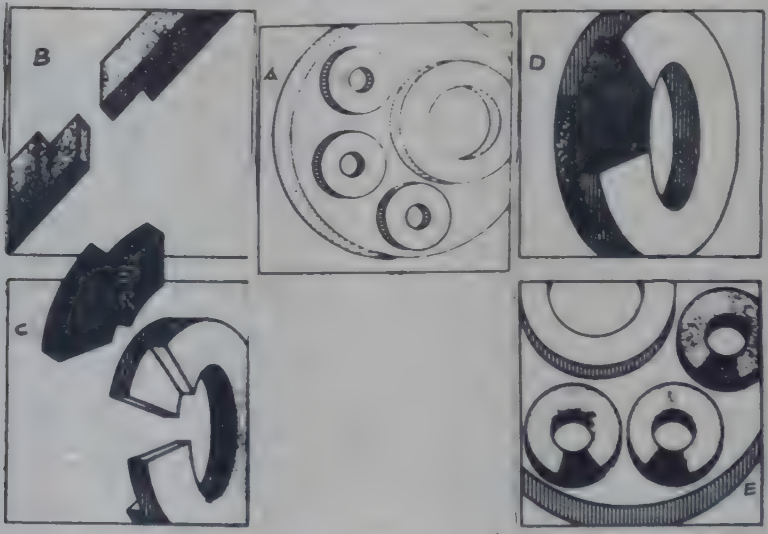
The process of re-combination is as follows: An E. coli bacterium is broken up by a detergent and the pieces are spun in a centrifuge to isolate the plasmids. The plasmid is then immersed in a restriction enzyme which cleaves the plasmid at the specifed place. The same enzyme is used to snip off a piece of DNA from a virus. The foreign gene (from the virus) is inserted into the cleavage of the bacterial plasmid and a re-combined molecule is formed. The new hybrid plasmid is then introduced into a bacterium. The bacterial cell divides and with it the plasmid also divides and multiplies (see *Fig 2*, p. 158).

"Gene splicing," says Time, "is the most powerful and awesome skill acquired by man since the splitting of the atom. It is an unparalleled exploratory tool for examining and in the process changing, the complicated machinery of heredity. If a gene of unknown function is inserted into a bacterium, it can act as a probe that lets scientists see precisely what it does. By such techniques researchers will finally speed up the formidable task of identifying, locating and analysing every one of the more than 100,000 genes found in the human cell".

Scope of the Technique. The Re-combinant DNA technique opens out many avenues of beneficial research. First comes the production of therapeutic proteins like interferon, insulin, hormones etc. Interferon is a powerful antiviral agent made by the human body. But its supply is very limited considering the demand. Its extraction from blood cells and other human tissues is costly too. A single injection of interferon today costs as much as 150 dollars. If, however, bacteria can be programmed to produce it (as has been done by Weismann early in 1981) the supply of interferon would be plentiful and cheap, coming down to a maximum of 1 dollar per shot. The reason is that as a manufacturing unit bacteria are unrivalled......Mechanical assembly lines, however sophisticated, can never compete with them. Replicating every 20 minutes a single bacterium can produce millions of bacteria in 24 hours all of them turning out interferon in unbroken succession.

Fig. 2

Re-combinant DNA Technique



(a) An E. coli bacterial cell, showing a chromosome and 3 plasmids. (b) A piece of DNA from a virus (foreign organism) is sliced off. The severed ends of the foreign plasmid. (c) The sliced off foreign DNA (top) and the cut out bacterial plasmid. (d) The foreign DNA is glued to the bacterial plasmid and the cleavage closed. (e) The bacterial cell with its chromosome and the new hydrid plasmids.

The same is the case with insulin, growth hormones, vaccines etc. Already genetically engineered bacteria have emerged as suppliers of scarce drugs like *enzyme urokinase* used to dissolve blood clots and *beta-endorphin*, one of brain's own pain killers. The human growth hormone used to treat dwarfism, formerly in short supply, is now being turned out by bacteria tailored to produce it. The case of insulin is slightly different. Insulin was being extracted from the pancreases of cows and pigs. This was enough supply. But it turned out that some people were allergic to animal insulin. Now, bacteria specially programmed for the purpose are producing insulin which avoids allergies.

Gene Therapy. Perhaps the most venturesome extension of the Re-combinant technique is what may be called gene therapy. Such a therapy is the only way out in certain blood diseases like thalassemia which has not so far yielded to any treatment. Thalassemia is one form of anaemia which is directly due to defective genes. The only way of keeping thalassemia patients alive is to give them transfusions of healthy blood. This is obviously no cure. So some doctors have cut corners by injecting the patients with new re-combinant genes which produce healthy blood cells. They believe that the new genes will multiply and crowd out the defective genes and thus eliminate the disease. *Washington Post* in a report datelined June 2, 1981 highlights the case of Dr. Cline of the University of California at Los Angeles (UCLA) who tried to cure two thalassemia patients, a 21-year-old woman of Israel and a 16-year-old woman of Italy by injecting them with healthy genes created by the gene splicing method. As on the date of the report, the women have not shown any improvement and still survived on transfusions. The National Institute of Health, USA has had Dr. Cline hauled up for violating the rules of bio-medical research (see below) and the Federal ban on genetic engineering trials on humans.

Industrial applications of the technique cover synthesis of protein molecules useful in industry, improvement of fermentation technology and production of proteins from waste. Agricultural applications include creation of plant cells capable of fixing atmospheric nitrogen, improving the quality and quantity of plant products, and endowing resistance to plants vulnerable to climatic variations and attacks of pests. Environmental applications are as important, but more urgent. Wastes can be converted into fertilisers more efficiently than by present day compost methods. Unmanageable pollutants like oil can be brought under control. In 1972 General Electric of USA patented a strain of oil-consuming bacteria developed by an Indian scientist Anand Chakrabarty in General Electric Laboratories. Permission for this patent was at first withheld on the ground that it was a natural product and a living organism to boot. The question went up to the US Supreme Court which finally sanctioned the patent (see below).

Control of Technique. The Re-combinant technique despite its beneficial aspects is hazardous in the extreme. It may produce gene combinations which, like so many Frankenstein's monsters, may set out to destroy their creators (the humans) themselves. In view of such a contingency it was at first proposed to ban all research in this technique. But considering its benign values, it was decided to control research instead of banning it altogether. So it was that the US National Institute of Health laid down certain guidelines for researchers. Experiences of the last 5 years of genetic engineering have dispelled many of the fears originally entertained in this matter. Consequently, this genie let out of the genetic bottle is allowed to roam under the watchful eyes of the scientists, instead of being tricked back into captivity.

The lines of research have been broadly classified at 3 levels. EK 1, 2, and 3. At EK 1 level, the use of E. coli 12, a strain that does not colonise human bowels, may be used. EK2 permits the use of 'crippled' E. coli 12 strain which cannot survive outside the laboratory. EK 3 is reserved for the EK 2 level host-vector system. Similarly laboratory conditions have been prescribed at 4 levels—P1, P2, P3 and P4. P1 level experiments require only the normal safeguards of accepted laboratory practices, and the use of E. coli 12 strain. P2, 3 and 4 correspond respectively to minimum isolation, moderate isolation and maximum isolation. At all levels any container used for the experiments and any contents left over are to be sterilised before they leave the laboratory premises.

Patents. Commercial applications of the Re-combinant technique have created many legal problems, the most important of which is the question of patents. Under the existing general laws of patents, natural products are not patentable, much less living organisms. But if any company produces a new hybrid gene after laborious research, it would be manifestly unfair to allow others to exploit the discovery on the ground that living organisms are not patentable. This question came up before the US Supreme Court in June, 1980 (General Electric case). The court ruled 5 to 4 that life forms evolved by any company are patentable. This has brought US law into line with the laws prevailing in many European countries, including Great Britain which treat life forms as patentable. This has also removed a great disincentive for research which would otherwise have crippled and probably strangled the Re-combinant technique.

45. TEST TUBE BABIES

Test tube babies or the production of babies in the laboratory is not a new idea. What is involved here is an artificial method of fertilisation, nothing more than that. The ovum of a woman is taken out and is fertilised by the sperm of a male in a test tube. The fertilised ovum is then implanted into the womb of the woman, who supplied the ovum. The fertilised egg attaches itself to the womb and completes its period of gestation within the womb in the normal manner and is delivered in the normal course. Here, there is very little interference with the natural process—the only difference being that the ovum is fertilised outside the womb (in a test tube) instead of in the fallopian tube of the woman concerned. Socially also, there is nothing reprehensible in this sort of reproduction, so long as the ovum is fertilised by the sperm of the husband.

Social, ethical or legal complications set in when the woman involved is unmarried or when the ovum is fertilised by the sperm of any male other than the husband of the woman. If the woman is unmarried there is the question of paternity or who the father is, and consequential problems. Similar difficulties arise if the ovum of a woman is fertilised by the sperm of any man other than her husband. It may also happen that the ovum of one woman, fertilised by the sperm of an unknown male, is implanted in the womb of another woman who brings forth the child. This is an extreme case where there will be two mothers for the same child and may be two fathers. In the case of an unmarried woman or a married woman whose ovum is fertilised by the sperm of any person other than her husband, the name of the donor of the sperm will not be revealed either to the woman herself or to any others. Similarly, the donor of the sperm will never know whose ovum he has fertilised. At least, this is one of the conditions the doctors insist upon, for obvious reasons. Legal complications apart, such revelations will be highly embarrassing to all concerned.

However, it was none of these difficulties which have obstructed the production of test tube babies so far. The difficulty was that the fertilised ovum, even if planted in the womb of the same woman, will not stay there till the end of the gestation period. It will be thrown out, that is; miscarried. All experiments for test tube babies have so far failed for this reason. The attempt of two British doctors at Oldham (England), 1978, is the first successful case in this direction.

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Second Baby from 'Nobel Sperm Bank'

A 40-year-old unmarried psychologist, Dr. Afton Blake, gave birth to the second baby to be produced by the "Nobel sperm bank," a family spokeswoman said here on Tuesday.

The 3.9-kg boy, born by a caesarian operation, was doing well and would be named Doron William Blake. Doron is a Greek word meaning gift.

The first bank baby, a girl, was born last month to Joyce Kowalski of Scottsdale, Arizona.—Reuter.

Los Angeles, Aug. 25, 1982.

46. FOOD & NUTRITION

Human diet is not restricted to any special category of food. Man can and does eat a variety of foods, of both plant and animal origin. Variety is, for him, the spice of life—more so in foods, than in anything else. This natural desire for variety is justified by the fact that no single food provides us with all the nutrients that we need. Cereals, like rice or wheat which form the staple food of mankind, supply us only with a fraction of our nutritional requirements. We have to supplement cereals with other foods that provide plenty of fats and proteins and minor quantities of a number of vitamins and minerals. This means that the larger our diet-sheet, the better our health will be. This will become evident, if we analyse what nutrients our foods contain and in what proportion.

The nutrients found in foodstuffs may broadly be classified as (1) Carbohydrates, (2) Fats, (3) Proteins, (4) Minerals, (5) Vitamins and (6) Water. Proteins, fats and carbohydrates are called Macro Nutrients.

Functions of Nutrient Groups

To supply heat energy and power	*To build and promote growth*	*To renew body tissues*	*To regulate body processes*
Carbohydrates	....	....	....
Fats	....	....	....
Proteins	Proteins	Proteins	Proteins
	Minerals	Minerals	Minerals
	Vitamins	Vitamins	Vitamins
			Water

MACRO NUTRIENTS

Proteins. Proteins (from the Greek word *Proteios* meaning first) are the most versatile elements in the body. They are the chief substances of the cells of the body. They form important constituents of muscles and other tissues and vital fluids like blood. Enzymes, which assist in the digestion of food, and anti-bodies which are the body defences against infections are also mainly protein in nature.

Amino acids. The nutritive value of protein depends on the essential amino acid composition. Amino acids are the bricks with which tissue protein is built and replaced. There are some 20 amino acids commonly found in dietary proteins. Of these, 10 amino acids can be synthesised by the body itself, whether by mutual conversion among amino acids or from non-protein sources. But 10 amino acids cannot be so synthesised and have to be supplied through diet. These are called *essential amino acids*. Adults require 8 essential amino acids while children require 9 or 10.

Protein Value of Indian Foods

Foodstuffs	*Biological value*	*Protein efficiency ratio*
Rice	68	2.2
Wheat	65	1.5
Maize	59	1.2
Bengal gram	68	1.7
Red gram	57	1.5
Groundnut	55	1.7
Gingelly seeds	62	1.8
Egg	94	3.9
Milk	84	3.1
Meat	74	2.3
Fish	76	3.5

Protein Requirements under Indian Conditions

Man (weighing 55 kg)	55 gm/day
Woman (weighing 45 kg)	45 gm/day
Woman Pregnant (II and III Trimester)	100 gm/day
Woman Lactating	110 gm/day

Infants and Children

0— 1 Year	3.5 gm	(per kg body-weight per day)
2— 5 Years	3.5 gm	„
6— 7 Years	3 gm	„
8—15 Years	2.5 gm	„
16—20 Years	2 gm	„

Fat. Fat, like protein, is a necessary ingredient in diet and is of value to the body in a number of ways. It is a concentrated source of energy and supplies per unit weight more than double the energy furnished by either protein or carbohydrates. Some fats, especially vegetable oils, provide what are called *essential fatty acids*, linoleic and arachidonic acids, to the body.

Cholesterol. Fats that circulate in the blood are of many types—triglycerides, phospholipids etc. The quantity and quality of fat consumed affects the level of cholesterol in the blood. Some fats like groundnut oil, sesame oil or safflower oil which contain a high proportion of poly-unsaturated fatty acids do not increase blood cholesterol levels greatly. Others like coconut oil, butter, ghee and hydrogenated vegetable oils (vanaspati) contain high proportions of *saturated fatty acids** and greatly increase cholesterol levels. It is also found that consumption of smaller amounts of fat at different times causes less increase of cholesterol than a large amount of fat at a time.

Carbohydrates. Carbohydrates include every kind of starch and sugar. Grain-foods are largely composed of starch and foodstuffs like cane sugar and glucose are pure carbohydrates. They form the main source of energy for the body. Being a cheap source of energy, carbohydrates form the bulk of Indian diet.

Balanced Diet. A balanced diet simply means a diet that will supply all the nutrients necessary for the growth and development of the body. In India, a balanced diet has become an imperative since most Indians consume foods that provide more carbohydrates and fats than proteins.

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* Saturated means that the fat molecule contains all the hydrogen atoms that it can hold. Unsaturated and poly-unsaturated oils (mostly vegetable oils) have room in the molecules for additional hydrogen atoms.

The table below gives the amounts of the various foods that will make up a balanced diet for the average Indian. The quantity of food varies according to age and the type of work.

Table 36
Composition of Balanced Diet

Foodstuffs	*Vegetarian*	*Non-Vegetarian*	*Vegetarian*		*Non-Vegetarian*	
	Amount	*Gms.*	*Calories*	*Protein (gm.)*	*Calories*	*Protein (gm.)*
Cereals	325	325	1150	29	1150	29
Dal & Nuts	100	50	320	22	160	11
Milk	200 (ml.)	100 (ml.)	235	8	117	4
Root vegetables	150	150	145	2	145	2
Other vegetables	100	100	50	3	50	3
Leafy vegetables	100	100				
Fruits	100	100	80	—	80	—
Egg	—	50 (1 no.)	—	—	85	6
Meat/Fish	—	100	—	—	195	18
Fat	50	50	450	—	450	—
Sugar/Jaggery	30	30	120	—	120	—
Total			2550	64	2552	73

47. MICRO NUTRIENTS

Vitamins and minerals comprise what are called micro nutrients as distinguished from proteins, fats and carbohydrates which are called macro nutrients.

VITAMINS

Vitamins can be broadly divided into fat-soluble and water-soluble vitamins. Vitamin **A, D, E** and **K** are fat-soluble vitamins. Vitamin **C** and **B** (including vitamins B_1, B_2 and other B-Group vitamins) are water-soluble.

Function of Vitamins. The vitamins are necessary auxiliaries in metabolism[*]. They combine with specific proteins, as parts of the various oxidative enzyme systems which are concerned with the breakdown of carbohydrates, proteins and fat in the body. Thus, they are intimately involved in the mechanism which releases energy, carbon dioxide and water as the end products of metabolism.

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[*] Metabolism represents the chemical processes going on in living organisms. It involves two activities:

i Catabolism, which reduces complex substances into simple ones, and releases energy, and

ii Anabolism, which comprises the building up of complex substances from simple ones. Metabolic reactions are mainly controlled by enzymes.

Table 37
Vitamins at a Glance

Name	*Function*	*Sources* *Vegetable*	*Animal*
Vitamin A Carotene[¶]	For normal vision, growth and healthy skin.	Fresh vegetables, fruits.	Fish-liver oil, whole milk, butter, curds and egg yolk.
Vitamin B_1 or Thiamine	For normal appetite and healthy nervous system	Whole grains, yeast, cabbage, carrot, onions, tomatoes, ground nuts,	Egg yolk, liver.
	B_2 Complex		
i. Riboflavin	For oxidation inside the cells, metabolism of amino acids & fatty acids	Green leafy vegetables, millets, pulses.	Milk and milk products, eggs, liver.
ii. Niacine[‡] (Nicotinic acid)	For utilisation of glucose and synthesis of fats	Yeast, outer parts of the grains, ground nuts.	Meat, liver, poultry, fish
iii. Pantothenic acid	For breakdown of fatty acids, cholesterol and phospholipids	All vegetables	Nil

iv. B_6 Pyridoxin†	Converts the amino acid tryptophan** into niacine, removes carbon dioxide from amino acids.	Whole grains, leafy vegetables	Meat, liver etc.
v. Folic acid (Folacin)	For multiplication and maturation of redblood cells	Fresh green vegetables, pulses	Liver
vi. Vitamin B_{12} (Cobalamin)	For multiplication and maturation of cells, synthesis of nucleic acids and proper functioning of the nervous systems	Nil	Milk, liver, meat.
vii. Vitamin H (Biotin)	For synthesis of choline and methionine maturation of red blood cells.	Molasses, yeast	Liver, milk, egg yolk
Vitamin C (Ascorbic acid)	Essential for collagenous or the inter-cellular material which holds the cells togther, and for quick healing of wounds.	Citrus fruits, pine-apple, cabbage, sprouted legumes, amla*	Nil
Vitamin D	For absorption and utilisation of calcium and for proper bone formation.	Nil	Liver, egg yolk, milk, butter, ghee,fish-liver oil
Vitamin E	For preventing harmful oxidation.	Lettuce, peas, vegetable oils	Liver, egg yolk, milk
Vitamin K	For proper clotting of blood.	Green leaves, tomatoes, spinach, cabbage	Liver, egg yolk

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¶ In vegetable foods, Vitamin A is often present in the form of *Carotene*, so called, after the orange pigment found in carrots. Carotene is converted by the body into vitamin A. It is therefore knowns as *pro-vitamin A*.

‡ The term niacine is now preferred to *nicotinic acid* to avoid confusion with the nicotine of tobacco.

† This vitamin exists in three active forms, *pyridoxins*, *pyridoxal* and *pyridoxamine*, which are mutually interchangeable in the body. ** Tryptophan is found in most good quality proteins.

* Amla or nellikka contains a high percentage of vitamin C, (600 mg per 100 gm) which is not lost by heating or drying, as is the case with other fruits or vegetables.

MINERALS

A large number of minerals is present in the body and performs a variety of functions. Minerals account for about 4 per cent of the body weight. Calcium and phosphorus form about three-fourths of the mineral elements. Five other minerals—potassium, sulphur, sodium, chlorine and magnesium—account for most of the rest. Many elements are present in such minute quantities that they are called *trace elements* or *micro-nutrients*.

Mineral Composition of the Human Body

1 Major Elements	*Percentage*	*Grams per 70 kg Weight*
Calcium	1.5 to 2.2	1050–1540
Phosphorus	0.8 to 1.2	560-840
Potassium	0.35	245
Sulphur	0.25	175
Sodium	0.15	105
Chlorine	0.15	105
Magnesium	0.05	35
2 Minor Elements		
Iron	0.004	2.8
Manganese	0.003	0.21
Copper	0.00015	0.105
Iodine	0.00004	0.024

Major Elements

Electro-chemical functions

Among the major elements calcium, potassium, sodium and magnesium when dissolved in water function as cations (pronounced cat-ions) and phosphorus, sulphur and chlorine as anions (pronounced an-ions), Cations are positively charged ions, that is, they are deficient in electrons and anions are negatively charged ions, that is surplus in electrons. These seven ions maintain the electrical neutrality of body fluids and cells and also play a part in maintaining the proper liquid volume of the blood and other fluid systems.

Calcium is the most abundant mineral in the human body, 99 per cent of which occurs in the bones and teeth and one per cent in the blood, other body fluids and soft tissues. Calcium aids in blood coagulation, activation of some enzymes and normal responses to nervous stimuli. Vitamin D is concerned with the optimum absorption of calcium.

Sources. Milk, cheese, egg, green vegetables, especially amaranth, fenugreek and drumstick leaves and tapioca.

Phosphorus. Eighty per cent of phosphorus is combined in the bones with calcium, the rest is in the soft tissues of the body. Phosphorus acts as a constituent of enzymes in the metabolism of carbohydrates and fats. It is a regulator of acid-base balance in blood and a transporter of fatty acids. In the form of *adenosine triphosphate* (*ATP*) it supplies energy for muscle contraction.

Sources. Liver, kidney, egg yolk, meat, fish, milk, cheese, cereals.

Potassium occurs primarily within the cell, muscles and red blood cells containing most of it. Potassium is essential, along with other minerals, in the contraction of the muscles, regular heart rhythm, the conduction of nerve impulse and maintenance of fluid balance.

Sources. Meat, fish, fowl, cereals, fruits and vegetables.

Sulphur is found mainly as a constituent of two amino acids, *cystine* and *methionine*. Cystine is important in skin, hair and nails. Methionine is important in the synthesis of adrenalin (product of adrenal glands) and creatin (a crystalline compound present in the muscles).

Sources. Eggs, cheese, milk, meat, nuts and legumes.

Sodium is mainly found in blood plasma and in inter-cellular fluid. It functions as a regulator of acid-base equilibrium, osmotic pressure, water balance, muscle contraction and nervous irritability.

Sources. Table salt, baking soda, baking powder, meat, milk and eggs.

Chlorine occurs as *sodium chloride* in the inter-cellular fluid and as *potassium chloride* in the cell. It is a constituent of stomach acids, acts as acid-base balance and regulates osmotic pressure.

Sources. Table salt, meat, milk, eggs.

Magnesium. Seventy per cent of magnesium is found in the form of phosphates and carbonates in the bones; the rest is in the muscles. It functions in collaboration with sodium, potassium and calcium in the regulation of cardiac, skeletal muscles and nerve tissues.

Sources. Cereals, nuts, legumes, meat and milk.

Minor Elements

Iron About 70 per cent of iron is in the form of haemoglobin in blood, 4 per cent as myoglobin in the muscles, 25 per cent in liver, bone marrow, spleen and kidneys and 1 per cent in plasma, iron and oxidative enzymes.

Traces of copper are necessary for the conversion of iron into haemoglobin. As red blood cells die, the iron contained in them is reclaimed by liver and spleen and put back into new blood cells. About 27 to 28 mg of iron is thus reclaimed daily and put back into use.

Sources. Liver, meat, egg yolk, raisins, peas, fish, whole grains, green vegetables.

Manganese aids in thyroxine formation, formation of urea, and activation of enzymes.

Sources. Whole grain, cereals, legumes, leafy vegetables, meat, fish and fowl.

Copper helps in absorption and metabolism of iron, oxidation of fatty acids, metabolism of ascorbic acid (vitamin C) and skin pigmentation. Copper is stored in liver and central nervous system and excreted by bile into the intestines.

Sources. Liver, shell-fish, nuts, legumes, and whole grain cereals.

Iodine. Most of the iodine is found in the thyroid gland and is used in the production of thyroxine. When the tissues use thyroxine, the iodine in it is released. About one-third of the iodine so released is used in the production of new thyroxine. Deficiency of iodine causes *goitre* (a swelling of the throat) and *cretinium* (under-development of mind and physique).

Sources. Sea foods, iodised salts and iodised sweets.

Trace Minerals are so called because only minute quantities of these minerals are required by the body. But this fact does not in any way diminish their importance. In this aspect, they are comparable to the vitamins.

Among the trace minerals or micronutrients found in living organisms are aluminium, arsenic, barium, boron, bromine, cadmium, cobalt, chromium, lead, molybdenum, nickel, selenium, silicon, strontium, tin, vanadium and zinc.

WATER

Water is a vital constituent of diet. An average man contains about 45 litres of water (70 per cent of the body weight). The cells contain 30 litres. Three litres are in the plasma of the blood, where the suspended cells make a total volume of blood upto 5 litres. The remaining 12 litres (45–33) fill the spaces between groups of cells. This is tissue fluid which bathes all the cells of the body.

Uses of water. Water is absolutely necessary for the digestion and absorption of the foods taken in. It is the great solvent and neutraliser in the body. It is the substance in which bodily chemical reactions take place. Water is the carrier or transporting medium for all nutrients and body substances. It regulates body temperature. It is the great purifying agent in the body and removes waste materials in the form of tears, perspiration, urine and faeces. Watery substances act as lubricants in the body, especially in the joints. It is a part of all body tissues and fluids.

Effects of deficiency. Acidosis, alkalosis and dehydration, oedema, fever, shock, uraemia and constipation are some of the clinical signs of inadequate salt and water in the body.

Sources. The body obtains water mainly from the fluids we drink, from the solids we eat and also from the oxidation of energy foods. Fats and carbohydrates are oxidised in the body to carbondioxide and water.

48. NUTRIENT VALUES

Cereals and Foodgrains. Cereals like rice, wheat and millets, ragi, cholam and bajra form the main food in India. Cereals are rich in carbohydrates. They generally contain 6 to 12 per cent protein, but these proteins are usually deficient in the essential amino acid *lysine*. Rice protein, however, is richer in *lysine* than other cereals. Most cereal grains are poor in mineral content and rice is especially poor. Ragi is, however, rich in minerals, especially in calcium, and bajra in iron. Whole cereal grains are important sources of B–vitamins but in milling, rice loses the outer layers containing thiamine. Parboiled rice, even when milled, does not lose its thiamine content. Except yellow maize, which contains some amounts of carotene, no other cereal grain is a source of vitamin A or C.

Pulses or legumes, as they are called, are rich in proteins. Pulse proteins, however, are of relatively low biological value because of the deficiency of the essential amino acid *methionine* but they are rich in *lysine*. Pulses are not rich sources of minerals but they are rich in B–vitamins. Dried pulses do not contain vitamin C but if they are germinated significant amounts of vitamin C are generated.

Leafy vegetables. Most of the green leafy vegetables are rich sources of calcium, iron, carotene, vitamin C, riboflavin and folic acid.

Roots and tubers are rich in carbohydrates. But foods like carrot are also rich in carotene (Vitamin A); those like potato contain significant amounts of vitamin C, while foods like tapioca contain calcium also.

Other vegetables are those which do not fall into the category of leafy vegetables or root vegetables. These vegetables are fruits, like lady's finger, cucumber, tomato, bitter gourd, snake gourd, brinjal etc. They are fairly good sources of vitamins and minerals.

Nuts and oil seeds are good sources of fat (oil), protein and minerals and fair sources of vitamins: eg., groundnut and cashewnut.

Fruits in general are rich in vitamin C, particularly, gooseberry (amla), guava (perakka) and citrus fruits. Yellow fruits like mango and papaya contain carotene and dried fruits like dates are sources of iron.

Fish and sea foods are rich sources of protein, B–vitamins and also minerals, especially calcium.

Fleshy foods are rich sources of protein and B–vitamins, especially B_{12}. They are generally deficient in vitamin A, but liver is an exception.

Egg is a rich source of all nutrients except vitamin C. Its protein is of high quality.

Milk & milk products. Milk is an ideal food for infants and young children and a good supplementary food for all. It contains all vital nutrients, except vitamin C and iron.

Table 38
Some Indian Food-Values

Values given are per 100 gm of edible portion.

Name of foodstuff	Protein gm	Fat gm	Minerals gm	Carbohydrates gm	Energy Kcal
Cereals					
Jowar	10.4	1.9	1.6	72.6	349
Maize, dry	11.1	3.6	1.5	66.2	342
Rice, par-boiled, milled	6.4	0.4	0.7	79.0	346
Rice, raw, milled	6.8	0.5	0.6	78.2	345
Wheat(whole)	11.8	1.5	1.5	71.2	346
Wheat flour maida)	11.0	0.9	0.6	73.9	348
Pulses and Legumes					
Green gram (whole)	24.0	1.4	3.5	56.7	334
Khesari dhal	28.2	0.6	2.3	56.6	345
Peas, dry	19.7	1.1	2.2	56.5	315
Soya beans	43.2	19.5	4.6	20.9	432
Leafy Vegetables					
Amaranth, tender	4.0	0.5	2.7	6.1	45
Araikeerai (cheera)	2.8	0.4	2.4	7.4	44
Cabbage	1.8	0.1	0.6	4.6	27
Drumstick leaves	6.7	1.7	2.3	12.5	92
Roots and Tubers					
Carrot	0.9	0.2	1.1	10.6	48
Potato	1.6	0.1	0.6	22.6	97
Tapioca	0.7	0.2	1.0	38.1	157
Yam, elephant	1.2	0.1	0.8	18.4	79
Other Vegetables					
Bitter gourd	1.6	0.2	0.8	4.2	25
Brinjal	1.4	0.3	0.3	4.0	24
Cauliflower	2.6	0.4	1.0	4.0	30
Cucumber	0.4	0.1	0.3	2.5	13
French beans	1.7	0.1	0.5	4.5	26
Lady's finger	1.9	0.2	0.7	6.3	35
Nuts & Oilseeds					
Almond	20.8	58.9	2.9	10.5	655
Cashewnut	21.2	46.9	2.4	22.3	596
Coconut, fresh	4.5	41.6	1.0	13.0	444
Groundnut	25.3	40.1	2.4	26.1	567
Fruits					
Amla(Nellikka)	0.5	0.1	0.5	13.7	58
Banana, ripe	1.2	0.3	0.8	27.2	116
Lime	1.5	1.0	0.7	10.9	59
Mango, ripe	0.6	0.4	0.4	16.9	74
Orange	0.7	0.2	0.3	10.9	48
Papaya, ripe	0.6	0.1	0.5	7.2	32
Pineapple	0.4	0.1	0.4	10.8	46
Tomato, ripe	0.9	0.2	0.5	3.6	20
Fish					
Pomfrets, white	17.0	1.3	1.5	1.8	87
Prawn	19.1	1.0	1.7	0.8	89
Sardine	21.0	1.9	1.7	—	101
Shrimp (small dried)	68.1	8.5	17.4	—	349
Meat					
Beef muscle	22.6	2.6	1.0	—	114
Egg, hen	13.3	13.3	1.0	—	173
Fowl	25.9	0.6	1.3	—	109
Goat meat	21.4	3.6	1,1	—	118
Pork, muscle	18.7	4.4	1.0	—	114
Milk and Edible Oils					
Milk, cow	3.2	4.1	0.8	4.4	67
Curds	3.1	4.0	0.8	3.0	60
Cheese	24.1	25.1	4.2	6.3	348
Ghee (cow)	—	100.0	—	—	900
Hydrogenated Oil (vanaspati)	—	100.0	—	—	900

Source: National Institute of Nutrition—ICMR —Hyderabad, India.

49. FOOD & ENERGY

Food is the only source of energy for humans. This means that our dietary sheet must change according to our requirements of energy. "If food is to perform the functions in the body it is meant to, namely producing energy, providing materials for body building and regulating body processes, meals must be planned. Good food selection, the cornerstone of good nutrition, must be learned as unfortunately there is no automatic built-in mechanism in human beings to direct the choice of foods which build healthy bodies and which keep them running satisfactorily from day to day."*

The question what food we should eat and how much, depends on the amount of energy we need. Food energy is measured in terms of heat units called calories. A physiological calorie, also called large calorie or kilocalorie (abbreviated as Kcal), is the amount of heat necessary to raise the temperature of one kilogram of water by one degree centigrade. One gram of protein or carbohydrates yields 4 calories. One gram of fat yields 9 calories while the same quantity of alcohol yields 7.

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* See *Food for Health*, Special Feature, in Manorama Year Book 1981.

Basal Metabolism. There is an irreducible minimum of energy expenditure, without which life is impossible. The absolute minimum is reached when one is asleep. For practical purposes, however, measurement is taken when the subject is awake, lying quiet, comfortably warm and relaxed, 12 to 15 hours after the last meal. This is known as *Basal Metabolism*. This represents the rock bottom energy necessary for survival. (see Energy Cycle, *Biosphere*, supra).

Comparative Calorie Consumption. Taking the calorie consumption of an average adult male doing sedentary work as 1, the calorie requirements of others work out as under:

Adult male (sedentary worker)	1.0
,, (moderate worker)	1.2
,, (heavy worker)	1.6
,, female (sedentary worker)	0.8
,, (moderate worker)	0.9
Adolescents (12—21 years)	1.0

Table 39

Human Expenditure of Energy

Men	*Rate in calories per hour*
Lying at ease	90
Sitting at ease	108
Sitting and writing	114
Standing at ease	118
Driving a car	168
Driving a motor cycle	204
Dressing, washing, shaving	212
Walking 4 mph	492
Climbing 6-inch stairs at 1½ mph	620
Bicycling at 13 mph	660
Running at 5 mph	850
Swimming, breaststroke	1212
Women	
Knitting	78
Typing at 60 w. p. m.	80
Ironing	100
Washing up	198
Bed making	420

Obesity. Obesity means an excessive accumulation of body fat. This results from the intake of more calories than the body can utilise. The excess calories are then stored as fat or adipose tissues. Generally the term *overweight* applies to persons whose weight is 10% more than the standard weight in terms of sex, age, height and weight. *Obesity* is gross overweight and refers to an excess of 20% more than the average weight for the population group.

The essential cause of obesity is the intake of calories in excess of metabolic requirements. Of course, heredity has a great deal to do with it. A survey conducted in a major city in USA (1976) showed that if both parents are obese 80% of the children will be obese; if only one parent is obese 40% of the children tend to become obese. If, however, both parents are normal only about 10% may show obesity.

Fat people often eat too much making them fatter and adding greater work load for the heart. They not only eat more but more of the wrong food—starchy, sweet or oily. All these add further to their excessive accumulation of fat.

The hypothalamus in the brain regulates the feelings of hunger and satiety. Any malfunctioning of the hypothalamus or other hormonal imbalances can induce obesity without reference to food habits. Such imbalances are, however, rare.

A person's food habits generally take shape during childhood. A number of unrelated factors dominate childhood diet. The financial position of the family, its cultural attainments, the relative importance attached to food, social customs, religious taboos and a number of extraneous factors operate to determine the food pattern of the children. However, lack of physical activity, which uses up the excessive supply of calories, ultimately remains the major cause of obesity.

The following table shows the calorie contents of some common foodstuffs.

Table 40

Calorie contents per 100 grams

Items		*Calories*
Bajra	..	361
Jowar	..	349
Rice	..	345
Wheat	..	346
Green gram dal	..	348
Lentils	..	343
Peas	..	315
Red gram dal	..	335
Cabbage	..	227
Curry leaves	..	108
Mint	..	48
Spinach	..	26
Beet root	..	43
Carrot	..	48
Onion	..	50
Potato	..	97
Radish	..	17
Sweet potato	..	120

Yam	111
Bitter gourd	25
Brinjal	24
Cauliflower	30
Green chillies	29
Cucumber	13
Drumstick	26
French beans	26
Unripe jackfruit	51
Lady's finger	35
Unripe mango	44
Pumpkin	25
Gourd	17
Cashewnut	596
Coconut	662
Groundnut	567
Apple	59
Banana	116
Guava	51
Jackfruit	58
Lime	59
Mango	74
Orange	48
Papaya	32
Pineapple	46
Pomegranate	65
Seethaphal	104
Water-melon	16
Mother's milk	65
Buffalo's milk	117
Cheese	348
Cow's milk	67
Curds	60
Goat's milk	72
Beef	114
Egg, duck	181
Egg, hen	173
Mutton	194
Pork	114
Betel leaves	44
Bread	245
Jaggery	385
Oil or Ghee	900
Sago	351
Sugar	400

The following tables show the height-weight ratio of 1. Adolescents and 2. Adults.

Table 41

1. Adolescents: Height-Weight Ratio

Average Height and Weight

Boys			*Girls*	
Height (cm)	*Weight (kg)*	*Age (yrs)*	*Height (cm)*	*Weight (kg)*
112.4	19.2	5+	112.5	18.6
118.8	21.9	5+	117.8	20.5
123.2	24.3	7+	123.2	23.8
127.9	26.1	8+	127.2	26.0
133.3	29.2	9+	132.5	29.0
138.0	31.0	10+	138.2	32.6
142.7	34.0	11+	145.1	36.3
148.4	37.8	12+	151.5	42.5
155.0	42.4	13+	153.8	43.9
162.6	47.3	14+	154.5	45.0
165.5	51.1	15+	155.8	47.3
168.9	54.8	16+	155.8	49.0

Source: Imprint, March 1981.

Table 42

2. Adults: Height-Weight Ratio

MEN				*WOMEN*			
	Weight in kg				*Weight in kg*		
Height	*Age*			*Height*	*Age*		
cms	*20*	*35*	*50*	*cms*	*20*	*35*	*40*
148	42.7	47.6	50.9	148	38.6	44.0	47.1
153	45.4	50.4	53.5	150	40.3	44.8	47.7
158	48.6	53.5	56.3	153	41.9	46.6	49.5
163	51.1	56.3	59.4	155	42.8	47.7	50.1
168	54.0	60.1	63.7	158	44.9	49.5	52.1
173	58.1	64.0	68.3	160	46.0	50.6	53.0
178	61.9	68.5	72.4	163	47.3	52.1	54.9
183	66 0	73.3	77.8	165	49.1	54.1	57.3

Source: Science Today, April 1980

50. ANIMAL WORLD

Comparative Speeds. The measurements given below are for maximum speeds over approximate quarter-mile distances. Exceptions—which are included to give a wide range of animals—are the lion and elephant, whose speeds were clocked in the act of charging; the whippet was timed over a 200-yard course; the cheetah over a 100-yard distance; man for a 15-yard segment of a 100-yard run, and the black mamba, six-lined race runner, spider, giant tortoise, three-toed sloth and garden snail were measured over various small distances.

The table is given in descending order of speed.

Table 43

Animals	*Speed (mph)*
Cheetah	70
Pronghorn antelope	61
Wildebeest	50
Lion	50

Thomson's gazelle	50
Quarter horse	47.5
Elk	45
Cape hunting dog	45
Coyote	43
Gray fox	42
Hyena	40
Zebra	40
Mongolian wild ass	40
Greyhound	39.35
Whippet	35.50
Rabbit (Domestic)	35
Mule deer	35
Jackal	35
Reindeer	32
Giraffe	32
White-tailed deer	30
Wart hog	30
Grizzly bear	30
Cat (domestic)	30
Man	27.89
Elephant	25
Black mamba snake	20
Six-lined race runner	18
Squirrel	12
Pig (domestic)	11
Chicken	9
Spider (Tegenaria artica)	1.17
Giant tortoise	0.17
Three-toed sloth	0.15
Garden snail	0.03

Source: Natural History March, 1974.

Life Span & Reproductive Rate. The following table shows the life span (in captivity, and the reproduction rate (in litters) of some commonly known animals.

Table 44

Name	*Life Span (Year)*	*Litters (Numbers)*
Ass	24	1
Black Bear	19	1-4
Buffalo	20	1
Camel	20	1
Cat (domestic)	15	1-6
Chimpanzee	30	1-2
Cow	18	1
Deer	17	1-2
Dog	16	1-12
Elephant	47	1
Fox	8	1-8
Giraffe	10	1
Goat (domestic)	17	1-6
Gorilla	25	1
Horse	27	1
Kangaroo	19	1-2
Lion	15-29	1-4
Monkey	7	1-2
Mouse (field)	4	1-10
Pig	14	4-6
Rabbit	5	1-13
Rhinoceros	27	1
Sheep	13	1-3
Tiger	19	2-4
Whale	37	1
Wolf	12	1-13
Zebra	20	1

Table 45

Domestic Animals

	Gestation (Pregnancy)			*Oestrus (heat)*		
Name	*Average Gestation (days)*	*Age of Weaning (weeks)*	*Age at Puberty (months)*	*Duration of Oestrus (days)*	*Recurrence after Non-conception*	*Recurrence after parturition (delivery) (weeks)*
Ass	360—380	12—20	12—24	2—4	7—9 days	3—4
Bitch	62	4—6	7—10	21	Twice Yearly	24—26
Cat	60	4—6	8—12	7—21	Twice Yearly	3
Cow	285	3—16	24—36	1—1½	3—7 weeks	3
Ewe	151	8—16	8—12	2—3	6—8 ,,	3
Goat	150	6—10	8—12	2—3	6—8 ,,	3
Mare	340	12—16	12—24	2—4	7—9 days	3—4
Rabbit	31	4—5	Varies with breed	Female always receptive		
Sow	120	3—9	4—5	2—4	7—8 weeks	3

51. LANDMARKS OF SCIENCE

Science, from the Latin *Scientia*, means learning or knowledge in its widest sense. In English, the word has a restricted application. It generally means physical and biological sciences.

Primitive Science. Primitive science can hardly be called science. It was a hotch-potch of superstition, magic and rituals. Nevertheless, this hotch-potch contained elements that were destined to become the foundations of science. Physical science came into being from the observation of natural phenomena like rain and shine, thunder and lightning. The attempts to fashion tools and build shelters resulted in the accumulation of a lot of information about the physical properties of the materials handled. Similarly, biological science developed from the observation of plants and animals, their growth, fertility, and reproduction. Medical science evolved as a specialised branch of biology, in the efforts of man to alleviate or cure pain and suffering.

Transition. At first, all natural phenomena—physical and biological—were interpreted as the operations of supernatural powers, which had to be worshipped, placated or appeased by magic rites and practices.

This primitive conception was refined and developed by the old world philosophers from Aristotle (4th cent. B. C.) to Aquinas (13th cent. A.D.). These philosophers eliminated much of the superstitious dross that had accumulated, but they could not dissociate science from metaphysics or religion. The Greek philosophers, Aristotle in particular, considered science and philosophy as one and the same. In the Middle Ages both science and philosophy had become bound up with theology. Aquinas, the greatest of the scholastic philosophers, regarded all the three subjects as parts of one grand system of philosophy.

Modern Science. It was left to Galileo to break up this misalliance and to strike out a new path for science—the path of experimental proof. This method initiated by Galileo was completed by Newton, and modern science was born. The essence of the new method was an appeal to sheer facts for proof. The new science tried to put together isolated facts in the same ways as we put together the words or pieces of a puzzle. Reason was used to solve the problems of the puzzle and to form synthesis or theories. But observation or experiment was the starting point of the investigation and the final arbiter.

India. In India too, science grew up from religion. The scientific lore of the Indus Valley people must have been very large, judging from the high degree of civilization they had attained. But we know little or nothing about them. With the coming of the Aryans, we get our first glimpses of science in India. The references in the Vedas, though couched in poetic language, still show that the early Aryans were quite at home in astronomy, mathematics, biology and medicine. In fact, as far back as the second millennium B. C., Indian philosophers had started laying down clearly defined scientific concepts in numbers, geometry and algebra.

THEORIES AND PRINCIPLES

A=Author T=Treatise

[Note: The letters A and/or T are shown only in places where the names of the author and the treatise are mentioned together or where there is a chance of mistaking one for the other.]

c. 1000 B.C. India

YAJURVEDA (T). Numbers named up to 10^{12} (million-million)—decimal system, addition, subtraction, multiplication, division, fractions. *Astronomy*—the Nakshatra (stars and constellations) system. Enumeration of 27 or 28 *Nakshatras* headed by Krithika (Pleiades).

800-700 B. C. India

TAITTIRIYASAMHITA (T). Progressive arithmetical series—odd and even numbers.

PANCHAVIMSA BRAHMANA (T) Geometrical progression.

SATAPATHA BRAHMANA (T) Summation of arithmetical and geometrical series.

700-600 B. C. India

SULBA SUTRAS (T) *Geometry*—Rules for drawing perpendiculars, squares, isosceles trapezium, etc. Combination and transformation of rectilineal figures.

LAGADHA (A) VEDANGAJYOTISA (T) *Astronomy*. Elaboration of calendrical science-summer and winter solstices. Rule for determining length of days between solstices.

600—500 B.C. India

BAUDHAYANA (A) *Geometry*—anticipation of the Pythagorean theorem—. "The diagonal of a rectangle produces by itself both (the areas) produced separately by its two sides."* Areas of triangles, parallelograms, trapezium etc. Volumes of prism, cylinder etc. The concept of *Algebra*—quadratic equations.

MANAVA Fixing the value of the π to 5 decimal places at 3.16049.

APASTAMBA Square root and cube root.

500—400 B.C. India

KATYAYANA Indeterminate Equations.

400—300 B.C. India

KAUTILYA (A) ARTHASASTRA (T) Mining, metallurgy etc.-incidental references.

300 B.C. India

BHADRABAHU (A) KALPASUTRA (T) Summation of geometrical series.

300 B.C. Greece

EUCLID (A) ELEMENTS (T) The first formal statement of geometrical principles.

200 B.C. India

PINGALA (A) CHANDAH SUTRA (T) Permutations and combinations—meruprasta or Pascal's triangle.

c. 200 B. C. Greece

ARCHIMEDES d. 209 B. C. *Hydrostatics*–the laws of floating bodies.

ARISTARCHUS OF SAMOS (A) Observations and calculations regarding rotation of the Earth and revolution round the Sun.

ERATOSTHENES First measurement of the circumference of the Earth.

2nd Cent. B.C. China

CHIU CHANG SUAN SHU (T) *Arithmetic* in nine sections—area of the segment of a circle.

2nd Cent. B.C. Greece

HIPPARCHUS Measurement of the distances to the Sun and the Moon—precession of the equinoxes.

A.D. 140 Greece

CLAUDIUS PTOLEMY (A) ALMAGEST (T) A synthesis of the current system of astronomical knowledge in Europe-remained the Bible of European astronomers for a long time.

A.D. 400 India

SURYASIDDHANTA (T) The first important astronomical treatise in India–was continuously revised and updated by subsequent astronomers.

A.D. 5th Cent. India

ARYABHATA (A) ARYABHATIYA (T) *Astronomy*. Theory of the rotation of the Earth, epicyclic theory of planetary motions. *Mathematics*- the values of the π (3.1416) and sines–alphabetical system of expressing decimal place value notation–extraction of square and cube roots–indeterminate equations of the first order.

A.D. 6th Cent. India

BRAHMAGUPTA (A) BRAHMASPHUTA SIDDHANTA AND KHANDAKHADYAKA (T) *Astronomy*—mean planetary motions, true planetary motions, problems of time, space, distance, lunar and solar eclipses—risings and settings of planets, Moon's cusps and shadows—conjunctions of planets—*Mathematics*—systematic operations with zero.

VARAHAMIHIRA (A) PANCHA SIDDHANTA (T) A survey of the development of astronomy and an exposition of astronomical theories. Other astronomical works by Varahamihira include *Brahat Samhita, Leghujataka* and *Yogayatra*.

AMARASIMHA (A) AMARAKOSHA (T) A lexicon–classification and synonyms of plants, animals, metals and minerals.

A.D. 7th Cent. India

BHASKARA I (A) MAHABHASKARIYA (T) Mean longitude of planets–Longitude connection–Time, place, direction, spherical trigonometry, latitudes and longitudes of junction stars-True longitudes of planets, rising, setting and conjunction of planets, astronomical constants.

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* The tradition attributing this theorem to Pythagoras started with Cicero (5 B. C.) nearly 5 centuries after Pythagoras. There is no mention of this theorem in Greek literature of the first 5 centuries after Pythagoras. The earliest proof of the Pythagorean theorem is given by Euclid. Baudhayana has not only stated the theorem but appears to have proved it as a standard rule for calculations.

A.D. 8th Cent. Middle East

MUHAMMED IBN IBRAHIM (A) SINDHIND and ARKAND (T) Translations into Arabic of Brahmagupta's *Brahmasphutasiddhanta (Sindhind)* and *Khandakhadyaka (Arkand)*

JABIR IBN HAYYAN (GEBER) Treatise on alchemy.

A.D. 9th Cent. India

MAHAVIRA (A) GANITASARA SAMGRAHA (T) A comprehensive compilation in mathematics including geometry, soild mensuration, quadratic, biquadratic and cubic equations and permutations and combinations.

A.D. 9th Cent. Middle East

Al-Khwariszi (T)—Theory of numbers in Arabic.

A. D. 9th Cent. India

BHASKARA II (A) SIDDHANTA SIROMANI (T) Mathematical and astronomical work —Beginnings of integral and differential calculus—the zenith of ancient Indian mathematics.

A. D. 10th Cent. India

GOVINDA BHAGAT(A) RASAHRYDAYA (T) A treatise on alchemy.

MANJULA (T) Astronomical treatise—precession of equinoxes.

A. D. 11th Cent. Middle East

AL HASAN– Arab physicist– Magnification and Refraction of light.

12th Cent. India

SOMADEVA (A) MANASOLLASA (T) *Alchemy*.

GANGADHARA (A) GANDHASARA (T) A treatise on cosmetics.

13th Cent. India

RASARNAVA (T) RASARATNAKARA (T) Treatises on alchemy.

13th Cent. Italy

LEONARDO OF PISA (A) LIBER ABACI (T) An exposition in Latin of Arabic arithmetic including decimal place value numeration, zero etc. This was the main source through which Indian numerals penetrated Europe.

16th Cent. India

RASAPRADIPA (T) A treatise on alchemy-one of the many treatises on alchemy prevalent in India.

1543 Poland

NICOLAS COPERNICUS— *Astronomy* — Foundation of modern astronomy—heliocentric structure of the solar system.

1556 Germany

GEORG BAUER (Agricola) (A) DE RE METALICA (T) Establishment of the Science of Minerals.

1559 Netherlands

GERHARD KREMER–Cylindrical Projection Map (Mercator's Projection) Establishment of the Science of *Cartography* (map making).

1589-92 Italy

GALILEO GALILEI—Discovery of the laws of motion—Science of *Dynamics*.

1600 U. K.

WILLIAM GILBERT (A) DE MAGNETE (T) 'The earth itself is a great magnet'—the basis of *Magnetism* and *Electricity*.

1609-19 Germany

JOHANNES KEPLER–The three fundamental laws of planetary motion.

1614 U. K.

JOHN NAPIER–*Logarithms*– a new method of arithmetical calculations.

1619 France

RENE DESCARTES—Formulation ot *Analytical Geometry*.

1620 U. K.

FRANCIS BACON (A) NOVUM ORGANUM (T) First formal exposition of *Inductive Logic*.

1661 U. K.

ROBERT BOYLE —Distinction between chemical elements and chemical compounds; the Science of *Chemistry*.

1665 U. K.

ROBERT HOOKE—Hooke's law.

c. 1670 U. K.

ISAAC NEWTON—Discovery of *Calculus*.

1675-76 Germany

GOTTFRIED LEIBNITZ —Discovery of *Calculus*.

1676 Denmark

OLAUS ROMER–Measurement of the velocity of light.

1676 Netherlands

LEEUWENHOEK—looks into the microscopic world and describes bacteria.

1687 U. K.

ISAAC NEWTON—Laws of gravitation and Universal laws of motion.

1690 Netherlands

CHRISTIAN HUYGENS—The wave theory of light.

1729 U. K.

STEPHEN GRAY-Electrical conductors and non-conductors—Insulation.

1728—1769 U. K.

JOSEPH BLACK-Theory of specific heat.

1735 Sweden

CAROLUS LINNEAUS (Karl von Linne) (A) SYSTEMA NATURAE (T) Foundation of the Science of *Taxonomy*—Divisions of the plant kingdom.

1736—1806 France

CHARLES AUGUSTINE COULOMB-Law of attraction and repulsion of electric charges.

1738—1822 U. K.

WILLIAM HERSCHEL- Identification of infrared rays.

1743—1794 France

ANTOINE LAVOISIER - Founding of *Organic Chemistry*.

1753 France

C.F. DU FAY-Fundamental law of electric charges-positive and negative.

1776—1810 Germany

JOHANN RITTER-Identification of ultra-violet rays.

1792 Germany

KARL F. GAUSS-Conception of non-Euclidean geometry.

1795 U. K.

JAMES HUTTON (A) Theory of the Earth (T) Founding of the Science of *Geology*.

1799 France

JOSEPH PROUST (A) The law of definite proportions of elements by weight in chemical compounds.

1801 Germany

KARL F. GAUSS - Mathematician and physicist-the unit of electromagnetic induction is named after him.

1803—1853 Austria

CHRISTIAN DOPPLER (A) Doppler effect.

1808—1827 U.K.

JOHN DALTON-Modern chemical atomic theory.

1811 Italy

AVOGADRO-Molecular hypothesis.

1814 France

ANDRE MARIE AMPERE (A) Laws of electromagnetic forces.

1814 Germany

WILLIAM WOLLASTEN & VON FRAUNHOFER-Discovery of dark lines in in solar spectrum.

1814—1874 Sweden

ANDERS ANGSTROM (A) Angstrom unit (ten billionth of a metre)

1815 U.K.

WILLIAM SMITH (A) Stratigraphic geology for dating geological formations.

1820 Denmark

CHRISTIAN OERSTED (A) Discovery of electromagnetism.

1821—1894 Germany

VON HELMHOLTZ (A) Formulation of the law of conservation of energy-the first law of thermodynamics.

1825—26 Russia

NIKOLAI I LOBACHEVSKY (A) Formulation of non-Euclidean geometry.

1825—26 Hungary

JANOS BOLYAI (A) Formulation of non-Euclidean geometry.

1827 Germany

GEORGE S. OHM (A) Statement of the law of electric conduction. (Ohm's Law).

1828 Germany

FRIEDRICH WOHLER (A) Synthesis of an organic compound from inorganic matter.

1830—31 U. K.

MICHAEL FARADAY (A) Discovery of electromagnetic induction.

1840 Germany

JULIUS R. VON MAYER-The law of conservation of energy—First law of thermodynamics.

1840 Germany

SCHONBEIN—Identification of Ozone.

1850 Germany

RUDOLF CLAUSIUS—The concept of entropy-Second law of thermodynamics.

1852 U. K.

EDWARD FRANKLAND—Concept of chemical valency.

1852 U. K.

MICHAEL FARADAY-Electrolysis.

1854 U. K.

GEORGE BOOLE (A) Invention of Boolean algebra-the mathematization of logic.

1855 US

MATHEW F. MAURY-Founding of the science of Oceanography.

1859 Germany

VON BUNSEN AND GUSTAV KIRCHOFF (A) Spectrography to identify chemical elements by their spectra.

1858-59 U. K.

CHARLES DARWIN (A) Origin of Species (T) A. R. WALLACE (A) The Theory of Evolution-Natural Selection.

1861 Germany

FREDERICH KEKULE (A) Establishment of organic chemistry as the chemistry of carbon compounds.

1864 U. K.

JAMES MAXWELL (A) The mathematical theory of electromagnetic induction.

1865 Austria

GREGOR MENDEL (A) Formulation of the laws of *Genetics* (heredity).

1869 Russia

DIMITRI MENDELEEFF (A) Periodic law and periodic table of elements.

1884 Germany

GEORGE CANTOR (A) *Mathematics*. Development of set theory, the basis of modern mathematics.

1884 Sweden

SVANTE ARRHENIUS (A) Concept of ionisation of solutions.

1887 Germany

HEINRICH HERTZ (A) Electrical magnetic waves called Hertz waves or radio waves.

1895 Germany

WILLIAM ROENTGEN (A) Short wave ray (X-ray).

1896 France

ANTOINE BECQUEREL (A) Discovery of radio activity in uranium.

1897 U. K.

JOSEPH THOMSON (A) Discovery of the electron.

1900 Austria

SIGMUND FREUD-Founding of the Science of Psychoanalysis.

1900 Germany

MAX PLANCK (A) The quantum theory.

1903 U. K.

ERNEST RUTHERFORD (A) Nature of radio active disintegration-emission of Alpha, Beta and Gamma rays.

1903 Russia

K. E. TSIOLKOVOSKY (A) Formulation of the fundamental principle of rocket flights.

1905 France

BINET & SIMON-Intelligence Tests.

1905-16 Germany

ALBERT EINSTEIN General and special theories of relativity.

1910 Switzerland

SOCKIE-Identification of Cosmic rays.

1911 Holland

H. KAMMERLINGH-ONNES-Discovery of superconductivity.

1912 U. K.

SODDY-Theory of Isotopes.

1913 Denmark

NIELS H. D. BOHR Formulation of the concept of the planetary atom.

1913 U. K.

HENRY G. L. MOSLY-Establishment of the concept of atomic number.

1913 U. K.

BERTRAND A. RUSSEL, ALFRED NORTH WHITEHEAD-Completion of *Principia Mathematica* (T) a major contribution to symbolic logic.

1919 U. K.

RUTHERFORD-Splitting the atom.

1924-26

WHITEHEAD (England), LOUIS V. de BROGLIE (France), and ERWIN SCHROEDINGER (Germany) Formulation of wave mechanics in atomic theory.

1925 Germany

WERNER HEISENBERG-Formulation of quantum mechanics in atomic theory.

1926 Russia

IVAN PETROVICH PAVLOV—*Biology* Conditioned reflexes.

1931 Germany

WOLFGANG PAULI-Postulation of existence of the neutrino-almost a quarter century before it was directly observed (1955).

1932 U. K.

JAMES CHADWICK-Discovery of the neutron.

1932 America

CARL D. ANDERSON-Discovery of the positron.

1934 America

MURPHY-Deuterium (heavy hydrogen).

ENRICO FERMI (b. Italy)-Neutron bombardment of uranium, leading to the production of transuranium elements.

1938

LISE MEITNER (Austrian Swedish), OTTO HAHN (German) and FRITZ STRASSMANN (German)-First nuclear fission of uranium.

1945 America

J. ROBERT OPPENHEIMER and others-Explosion of first atomic bomb.

1947 America

WILLARD F. LIBBY-Development of atomic time clock-a method for determining geological age-by measuring the amount of radio active carbon-14 in an organic or carbon-containing object.

1948 America

JOHN BARDEEN WALTER H. and BRATTAIN WILLIAM SHOCKLEY-Formulation of theory of the transistor and its construction.

1951 America

ATOMIC ENERGY COMMISSION-Explosion of first nuclear fusion (hydrogen) bomb.

1954 America

CHARLES H. TOWNES-Construction of first Maser.

1955 America

EMILO G. SEGRE American (b. Italy) OWEN CHAMBERLAIN (American). -Production and detection of the subatomic particles, the antiproton.

1957 America

GORDON GOLD-Construction of the first Laser.

1957 Russia

USSR ACADEMY OF SCIENCE-First man-made satellite Sputnik put into orbit around the Earth.

1958 America

JAMES A. VAN ALLEN-Discovery of belts of high energy radiation surrounding the Earth.

1962

FRANCIS H. C. CRICK (Britain). JAMES D. WATSON (America) and MAURICE H. F. WILKINS (Britain)- Discovery of the structure of the DNA.

1963 America

THOMAS A. MATHEWS and ALLEN R. SANDAGE-Discovery of quasars.

1967 America

DAVID HARKER and others-Deciphering the structure of ribonuclease (RNA).

1968 America

R. BRUCE MERRIFIELD and otners Synthesizing of ribonuclease molecule.

1968 U. K.

ANTONY HEWISH (Cambridge)-Identification of Pulsars.

1970 America

HAR GOBIND KHORANA-makes the first synthetic gene, a duplicate of a gene found in yeast cell.

1971 US

H. TEMIN-Discovery of reverse transcriptase for synthesizing DNA from RNA

1973 US

National Aeronautical and Space Administration (NASA) The first orbiting laboratory-the Skylab.

1974 US

SAM TING and others, BURT RICHTER and others Detection of pai particles.

1976 US

H. G. KHORANA (M. I. T.)-replicates a bacterial gene and plants it in a living cell, where it started working. A working model of a synthetic gene.

1976 US

LEON LEDERMAN and others-Discovery of particle with charm-confirmation of the concept.

17
Element 107

Every atom consists of a nucleus of protons and neutrons surrounded by electrons which are exactly equal to the number of protons. Starting with hydrogen which has a single proton, naturally occurring elements end with uranium, which has 92 protons. The scientists took over at this point, synthesising new elements, transuranides, as they have been called.

By 1969 they had added 11 new elements, making a total of 103. In 1969 Element 104 appeared and 105 in 1970 (see **Elements**). *The Russians synthesised Element 106 in 1974. In 1981, the Germans came up with Element 107, the heaviest atom yet synthesised.*

18

Einstein's Last Dream

From the earliest times, man's dream has been to comprehend the complexity of nature in terms of as few unifying concepts as possible. In this context, in the history of physics, three names stand together; those of Newton, Maxwell and Einstein, as among the greatest synthesisers and unifiers of all time. Newton, some three hundred years ago, identified and unified terrestrial gravity (the force which makes apples fall) with celestial gravity (the force which keeps planets in orbit around the sun). Maxwell, two hundred years later, unified the forces of electricity and magnetism. He further showed that light was one manifestation of this unification. Einstein, in 1905, unified the concepts of space and time. Eleven years later, he could show that Newton's gravity was a manifestation of this audacious unification in the sense that Newtonian gravity signified a curvature of the united space-time manifold. The question which Einstein then asked was this: Could Maxwell's electromagnetism be united with Newtonian gravity in the same way that Maxwell had united electricity and magnetism? If so, was Maxwell's electromagnetism also a manifestation of some other geometrical property of the space-time manifold just as Newtonian gravity was a manifestation of its curvature? This was Einstein's last dream. The researches of Abdus Salam and others lead us to belive that the weak and strong forces can be combined with the forces of electromagnetism and gravity to form one unified force.

old

52. INVENTIONS & DISCOVERIES

Scientific inventions and discoveries are important because they lead to the creation of mechanisms and artifacts which improve or easen our living conditions. However, there is often a long time lag before the inventions are transformed into working utilities. Reviewing some 46 discoveries between 1900 and 1950, *A History of Technology*† points out that longest intervals—50 to 80 years—were taken up by the flourescent lamp and the cotton picker and the shortest—one year—by Freon refrigants.

Inventions and discoveries come about sometimes by accident but mostly by design. Roentgen discovered X-ray by accident in 1895 but the Curies laboriously pursued the radium and discovered it eventually in 1898. Most of the discoveries in the 20th century were the results of purposeful investigations and experiments, though some like penicillin were discovered accidentally. Accidental discoveries are, in fact, few and far between but even then only a scientist of unusual acumen can identify it as a discovery in the first instance. Others might have noticed the same thing before to no purpose. The classic instance is the Archimedes Principle. Thousands of people would have noticed that when they get into a full tub some water flows out. But Archimedes, alone among the thousands, could see a principle in it.

Many inventions have been made under the compulsive necessities of war. The Nazis developed rocketry and ballistic missiles to destroy England. America made the atom bomb to crush Japan. The Allies developed Radar and Sonar to protect themselves. All these inventions have turned out to be quite beneficial in peacetime. Rocketry and missiles opened the way for space exploration and the epochal landing of men on the moon. Atomic power is now being harnessed for peacetime uses. Radar and Sonar have been helpful in a number of ways. Sonar, for instance, has made commercial fisheries safer and more productive.

Invention/Discovery	*Date*	*Inventor/Discoverer*	*Country*
Acetylene gas	1892	Wilson	USA
Adding machine	1642	Pascal	France
Aerosol Spray	1941	Goodhue	USA
Airbrake	1868	Westinghouse	USA
Air Conditioning	1911	Carrier	USA
Airplane (Jet engine)	1930	Whittle	Britain
Airplane with motor	1903	Orville and Wilbur Wright	USA

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† A History of Technology. Ed. Trevor I. William.

Air Pump	1650	Von Guerick	Germany
Airship	1852	Giffard	France
Airship (non-rigid dirigible)	1900	Zeppelin	Germany
Aluminium, electrolytic process	1886	Hall	USA
Aniline dye*	1856	Perkin	Britain
Aqualung	1943	Cousteau	France
Autogyro	1920	de la Cierva	SPain
Automatic motors	1904	Westinghouse	USA
Automobile, differential gear	1885	Benz	Germany
Automobile, gasoline	1887	Daimler	Germany
Automobile, magneto	1899	Daimler	Germany
Automobile, self-starter	1911	Kettering	USA
Bakelite	1907	Baekeland	Belgium
Balloon	1783	Montgolfier Brothers	France
Balance Spring	1675	Huygens	Holland
Ball-bearing	1794	Vaughan	Britain
Balance Spring (watch)	1658	Robert Hooke	Britain
Barometer	1643	Torricelli	Italy
Bicycle, modern	1884	Starley	Britain
Bicycle, safety	1886	Pope	USA
Bifocal lens	1780	Franklin	USA
Bleaching powder	1798	Tennant	Britain
Bottle Machine	1903	Owens	USA
Bordeaux Mixture	1885	Millardet	France
Braille Printing	1829	Braille	France
Burner-gas	1855	Bunsen	Germany
Calculating Machine	1823	Babbage	Britain
Canning	1820	Durand	Britain
Camera, Polaroid lens	1948	Land	USA
Carburettor gasoline	1876	Daimler	Germany
Carding machine	1797	Whittemore	USA
Cathode Ray Tube	1878	Crookes	Britain
Cellophane	1911	Brandenberger	Switzerland
Celluloid	1870	Hyatt	USA
Cement (Portland)	1845	Aspdin	Britain
Chronometer	1761	Harrison	Britain
Cinematograph	1895	Lumiere Brothers	France
Clock pendulum	1657	Huygens	Holland
Coaxial cable system	1929	Affel & Espensched	USA
Computer (original model)	1823	Babbage	Britain
Computer (electronic)	1946	Eckert Manchly	Britain
Condenser microphone (telephone)	1920	Wente	USA
Cotton gin	1793	Whitney	USA
Cream separator	1880	De Laval	Sweden
Cultivator, disc	1878	Mallon	USA
Cyclotrone	1930	Lawrence	USA
DDT	1874	Zeidler	Germany
Diesel engine	1895	Diesel	Germany
Dynamite	1862	Nobel Alfred	Sweden
Dynamo	1831	Faraday	Britain
Electric battery	1800	Volta	Italy
Electromagnet	1824	Sturgeon	Britain
Electroplating	1805	Brugnatelli	Italy
Electrolysis	1852	Faraday	Britain
Elevator, push button (Lift)	1922	Larson	USA
Elevator brake (Lift)	1852	Otis Watson Wilkins	USA USA Britain
Engine, gasoline	1886	Daimler	Germany

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* So-called after the natural dye indigo, which the Portuguese called anil.

Engine, gas vacuum	1823	Brown	Britain
Engine, steam piston	1705	Newcomen	Britain
Engine, automobile	1879	Benz	Germany
Engine, jet	1939	Von Ohain	Germany
Engine, jet	1941	Frank Whittle	Britain
Engraving halftone	1893	Ives	USA
Filament, tungsten	1915	Langmuir	USA
Food preservation	1809	Apert	France
Galvanometer	1820	Sweigger	Germany
Gas lighting	1792	Murdoch	Scotland
Gas mantle	1885	Welsbach	Austria
Geiger counter	1913	Geiger	Germany
Glider	1853	Cayley	Britain
Gold (cyanide process for extraction)	1887	Forest	Britain
Gun, Breechloader	1811	Thornton	USA
Gun, Browning	1916	Browning	USA
Gun, silencer	1909	Maxim, H.P.	USA
Gunsight—telescope	1891	Fisk	USA
Gyroscope	1852	Foucault	France
Gyrocompass	1905	Sperry	USA
Harvester	1836	Moore	USA
Helicopter	1907	Cornce	France
Hovercraft	1959	Cockerall	Britain
Hydraulic jack	1795	Brahm	Britain
Ice making machine	1851	Govil	USA
Indigo (synthesis)	1880	Baeyer	Germany
Kaleidoscope	1817	Brewster	Britain
Kinetoscope	1887	Edison	USA
Lamp, arc	1879	Brush	USA
Lamp, incandescent	1879	Edison	USA
Lamp, incand. gas	1916	Langmuir	USA
Lamp, mercury vapour	1912	Hewitt	USA
Lamp, miner's safety	1816	Davy	Britain
Lamp, Neon	1915	Claude	France
Laser*	1957	Gordon Gould	USA
Lathe, (turret)	1845	Fitch	USA
Launderette	1934	Cantrell	USA
Leyden Jar	1746	Bevis	Britain
Leyden Jar (condenser)	1745	Von Kleist	Germany
Lightning rod	1752	Franklin	USA
Linoleum	1860	Walton	Britain
Linotype	1885	Mergenthaler	USA
Lithography	1796	Senefelder	Czechoslovakia
Lifeboat	1790	Greathead	Britain
Locomotive (electric)	1851	Vail	USA
Locomotive (practical)	1829	Stephenson	Britain
Loom, power	1785	Cartwright	Britain
Loudspeaker, dynamic	1924	Rice-Kellogg	USA
Machine gun	1861	Gatling	USA
Machine gun (Maxim)	1883	Maxim H. S.	Britain
Magnet, electro	1828	Henry	USA
Magnetic Needle	11th Century	....	China
Maser*	1951	Charles Townes	USA
Mason Jar	1858	Mason J.	USA
Match (friction)	1827	John Walker	Britain
Match (phosphorus)	1831	Sauria	France
Match (sulphur)	1830	Jones	Britain
Mercerized textiles	1843	Mercer J.	Britain
Micrometer	1636	Gascoigne	Britain

* See box, Page 113, Manorama Year Book, 1981.

Microphone	1877	Berliner	USA
Microscope, compound	1590	Janssen	Holland
Microscope, electron	1931	Knoll-Ruska	Germany
Milk condensation	1853	Borden	USA
Microwave cooking	1940	Randalls Boot	Britain
Monotype	1887	Lanston	USA
Motor AC	1892	Tesla	USA
Motor, rotary	1907	Ocenasek	Czechoslovakia
Motorcycle	1885	Daimler	Germany
Movie (talking)	1927	Warner Bros.	USA
Mower, lawn	1868	Hills	USA
Nitroglycerin	1846	Sobrero	Italy
Nylon synthetic	1930	Carothers	USA
Nylon	1937	Du Pont (lab)	USA

19

Halley's Comet Sighted

Halley's Comet has been sighted for the first time since it last zipped by Earth in 1910, astronomers at Caltech have said.

After searching the skies for more than a year with the giant 200-inch hale telescope at Mt. Palomar near San Diego, astronomer Edward Danielson and graduate student David Jewitt spotted the comet on Friday night.

"We relooked at the field on Monday night to verify that it was still there and it was", Mr. Danielson said yesterday.

"The comet, which passes near enough to Earth to be seen every 76 years, is now about 11 AUs from both the Sun and the Earth", Danielson said. An AU is about 148,800 million km, the average distance of the Sun from the Earth. At its closest point in 1986, the comet will be about 1.5 AUs from Earth. At the most distant point in its orbit, it is about 40 AUs from Earth.

U. P. I. Pasadena, Oct. 21, 1982.

Paper (woodpulp) (sulphite process)	1867	Tilghman	USA
Paper (wood pulp) (sulphate process)	1884	Dahl	Germany
Paper machine	1809	Dickinson	USA
Parachute	1785	Blanchard	France
Pen, ballpoint	1888	Loud	USA
Pen, fountain	1884	Waterman	USA
Percussion Cap	1841	Shaw	USA
Phonograph	1877	Edison	USA
Photo, colour	1892	Ives	USA
Photo, film celluloid	1887	Goodwin	USA
Photo, film transparent	1888	Eastman-Goodwin	USA
Photographic paper	1898	Baekeland	USA
Photography	1826	Niepce, Sr.	France
Photophone	1880	Bell	USA
Photo telegraphy	1925	Bell lab	USA
Piano	1709	Cristofori	Italy
Pin, safety	1849	Hunt	USA
Pistol (Revolver)	1835	Colt	USA
Piston-cylinder system	1690	Papin	France
Plough-Cast iron	1797	Newbold	USA
Plough-Disc	1896	Hardy	USA
Plywood	1830	Immanuel Nobel*	Sweden
Printing, colour	1457	P. Schoeffler	Germany

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* Father of Alfred Nobel

Printing Press rotary	1846	Hoe	USA
Pressure cooker (Steam digester)	1679	Denis Papin Robert Boyle, J.	France Britain
Radar**	1935	Robert Watson Walt	Britain
Radio Amplifier	1907	De Fore	USA
Radio valve	1904	Fleming	Britain
Radio broadcaster	1902	Stubblefield	USA
Radio signals	1895	Marconi	Italy
Radio activity	1896	Becquerel	France
Radium	1898	Curie, Pierre Curie, Marie	France Poland
Rayon	1883	Swan	Britain
Razor, electric	1931	Schick	USA
Razor, safety	1895	Gillete	USA
Reaper	1834	McCormick	USA
Record, disc	1887	Berliner	USA
Record wax cylinder	1888	Edison	USA
Refrigeration	1834	Perkins	USA
Resin, synthetic	1931	Hill	Britain
Rifle (Repeating)	1860	Spencer	USA
Rocket engine	1929	R. H. Goddard	USA
Rotary engine	1926	Wankel	Germany
Saw, band	1808	Newberry	Britain
Saw, circular	1777	Miller	Britain
Screw-cutting lathe	1569	Besson	Britain
Sextant	1757	Compell	Britain
Sewing machine	1846	Howe	USA
Shuttle, flying	1733	Kay	Britain
Sleeping Car	1858	Pullman	USA
Spectroscope	1859	Kirchoff	Germany
Spinning Jenny	1767	Hargreaves	Britain
Steam boat, practical	1802	Symington	Britain
Steam boat, practical	1807	Fulton	USA
Steam engine	1712	Newcomen	Britain
Steam engine (improved)	1765	James Watt	Britain
Steamship (complete)	1843	Great Britain (Name of ship)	Britain
Steam turbine	1884	Parsons	Britain
Steel (mild)	1856	Bessemer	Britain
Steel	1857	Kelly	USA
Steel alloy	1891	Harvey	USA
Steel alloy, high speed	1901	Taylor-White	USA
Steel, Stainless	1916	Brearley	Britain
Stereoscope	1838	Wheatstone	Britain
Storage Battery (Electric)	1812	Ritter	Germany
Submarine	1891	Holland	USA
Submarine, torpedo	1776	Bushnell	USA
Tank, military	1914	Swinton	Britain
Tape Recorder (Magnetic)	1899	Poulsen	Denmark
Telegraph wireless, high frequency	1896	Marconi	Italy
Telegraph	1837	Cooke & Wheatstone	Britain
Telegraph code	1837	Morse	USA
Telephone	1876	Bell	USA
Telephone, automatic	1891	Strowger	USA
Telephone, radio	1902	Poulsen and Essenden	USA

** Radar is not the invention of any one scientist or country. Scientists from USA, France and Britain made significant contributions to its invention. In 1935, the British physicist Robert Watson-Watt patented the first device to follow a moving aeroplane. This may be considered the starting point of radar technology. However this device lacked operational efficiency. It was only after the invention of the magnetron that the radar became a tactically powerful device in war. The magnetron was devised by the scientists of the Birmingham University in 1940.

Telescope	1608	Lippershey	Netherlands
Telescope	1609	Galileo	Italy
Television	1926	Baird	Britain
Thermometer	1593	Galileo	Italy
Thermometer	1710	Reaumur	France
Thermometer (Mercury)	1714	Fahrenheit	Germany
Torpedo	1866	Whitehead	Britain
Torpedo, marine	1804	Fulton	USA
Tractor, caterpillar	1900	Holt	USA
Transformer	1831	Faraday	Britain
Transistor	1947	Shockley, Brattain, Bardeen	USA
Tungsten (drawn) filament lamp	1913	Coolidge	USA
Turbine gas	1899	C. G. Curtis	USA
Turbine, hydraulic	1849	Francis	USA
Turbine, steam	1896	C. G. Curtis	USA
Tyre, bicycle	1889	Dunlop	Britai
Tyre, pneumatic	1888	Dunlop	Britain
Type, movable	1850	Gutenberg	Germany
Typewriter	1868	Sholes	USA
Universal joint	1676	Hooke	Britain
Vacuum flask	1892	Dewar	Britain
Vulcanisation	1884	Goodyear	USA
Weaving Machine	1733	Kay	Britain
Welding, electric	1877	Thomson	USA
Wind tunnel	1923	Munk	USA
Wire, barbed	1874	Giddeen	USA
X-ray tube	1916	Coolidge	USA
Zip fastener	1913	Sundback	Sweden

53. ELEMENTS

An element may be defined as "a substance which cannot be broken down to yield simpler substances by ordinary chemical methods". The elements are the basic substances from which all others are built up by chemical combinations.

Elements and Symbols		*Atomic Number*	*Atomic Weight*	*Discoverer*	*Date*
Actinium	(Ac)	89	227.0	A. Debierne	(1899)
Aluminium	(Al)	13	27.0	F. Wohler	(1827)
Americium	(Am)	95	(243)	G. Seaborg & others	(1944)
Antimony	(Sb)	51	121.8	B. Valentine	(1604)
Argon	(A)	18	39.9	W. Ramsay and J. Rayleigh	(1894)
Arsenic	(As)	33	74.9	A. Magnus	(?) (1250)
Astatine	(At)	85	(210)	E. Segre & others	(1940)
Barium	(Ba)	56	137.3	H. Davy	(1808)
Berkelium	(Bk)	97	(249)	S. Thompson & others	(1949)
Beryllium	(Be)	4	9.0	N. Vauquelin	(1798)
Bismuth	(Bi)	83	209.0	C. Geoffrey the Younger	(1953)
Boron	(B)	5	10.8	H. Davy	(1808)
Bromine	(Br)	35	79.9	A. Balard	(1826)
Cadmium	(Cd)	48	112.4	F. Stromeyer	(1817)
Calcium	(Ca)	20	40.1	H. Davy	(1808)
Californium	(Cf)	98	(251)	S. Thompson & others	(1950)
Carbon	(C)	6	12.0	....	Prehistoric
Cerium	(Ce)	58*	140.1	J. Berzelius & Wd' Hislinger	(1803)
Cesium	(Cs)	55	132.9	R. Bunsen & G. Kirchhoff	(1860)
Chlorine	(Cl)	17	35.5	K. Scheele	(1774)
Chromium	(Cr)	24	52.0	N. Vauquelin	(1797)

Cobalt	(Co)	27	58.9	G. Brandt	(c. 1735)
Copper	(Cu)	29	63.5	....	Prehistoric
Curium	(Cm)	96	(248)	G. Seaborg & others	(1944)
Dysprosium	(Dy)	66*	162.5	L. de Boisbaudran	(1886)
Einsteinium	(E)	99	(254)	A. Ghiorso & others	(1953)
Erbium	(Er)	68*	167.3	C. Mosander	(1839)
Europium	(Eu)	63*	152.0	E. Demarcay	(1896)
Fermium	(Fm)	100	(253)	A. Ghiorso & others	(1952)
Fluorine	(F)	9	19.0	H. Moissan	(1886)
Francium	(Fr)	87	(223)	M. Perey	(1939)
Gadolinium	(Gd)	64*	157.3	J. C. de Marignac	(1880)
Gallium	(Ga)	31	69.7	L. de Boisbaudran	(1875)
Germanium	(Ge)	32	72.6	C. Winkler	(1886)
Gold	(Au)	79	197.0	....	Prehistoric
Hafnium	(Hf)	72	178.5	D. Coster & G. de Hevesy	(1923)
Helium	(He)	2	4.0	J. C. P. Janssen & N. Lockyer	(1868)
Holmium	(Ho)	67*	164.9	J. Soret & M. Delafontai	(1878)
Hydrogen	(H)	1	1.0	H. Cavendish	(1766)
Indium	(In)	49	114.8	F. Reich & T. Richter	(1863)
Iodine	(I)	53	126.9	B. Courtois	(1811)
Iridium	(Ir)	77	192.2	S. Tennant	(1803)
Iron	(Fe)	26	55.9	....	Prehistoric
Krypton	(Kr)	36	83.8	W. Ramsay & M. Travers	(1898)
Lanthanum	(La)	57*	138.9	C. Mosanter	(1839)
Lawrencium	(Lr)	103	257.0	A. Ghiorso & others	(1961)
Lead	(Pb)	82	207.2	....	Prehistoric
Lithium	(Li)	3	6.9	A. Arfvedson	(1817)
Lutetium	(Lu)	71*	175.0	G. Urbain	(1907)
Magnesium	(Mg)	12	24.3	Recognized by. J. Block	(1755)
Manganese	(Mn)	25	54.9	Recognized by K. Scheele	(1774)
Mendelevium	(Mv)	101	(256)	A. Ghiorso & others	(1955)
Mercury	(Hg)	80	200.6	....	Prehistoric
Molybdenum	(Mo)	42	95.9	K. Scheele	(1778)
Neodymium	(Nd)	60*	144.2	C. Von Welsbach	(1885)
Neon	(Ne)	10	20.2	W. Ramsay & M. Travers	(1898)
Neptunium	(Np)	93	(237)	E. Mc Millan & P. Abelson	(1940)
Nickel	(Ni)	28	58.7	A. Cronstedt	(1751)
Niobium (Columbium)	(Nb)	41	92.9	C. Hatchett	(1801)
Nitrogen	(N)	7	14.0	D. Rutherford	(1772)
Nobelium	(No)	102	(254)	Fields & others	(1951)
Osmium	(Os)	76	190.2	S. Tennant	(1803)
Oxygen	(O)	8	16.0	J. Priestly	(1774)
Palladium	(Pd)	46	106.4	W. Wollasten	(1803)
Phosphorus	(P)	15	31.0	H. Brand	(1669)
Platinum	(Pt)	78	195.1	D. de Ulloa	(1735)
Plutonium	(Pu)	94	(242)	G. Seaborg & others	(1940)
Polonium	(Po)	84	210.0	P. & M. Curie	(1898)
Potassium	(K)	19	39.1	H. Davy	(1807)
Praseodymium	(Pr)	59*	140.9	C. von Welsbach	(1885)
Promethium	(Pm)	61*	(147)	J. Marnsky & others	(1947)
Protactinium	(Pa)	91	231.0	F. Soddy & others	(1917)
Radium	(Ra)	88	226.1	P. & M. Curie	(1898)
Radon	(Rn)	86	222.0	Rutherford (thoron isotope)	(1899)
				E. Dorn (radon isotope)	(1900)
Rhenium	(Re)	75	186.2	E. Noddack & others	(1925)
Rhodium	(Rh)	45	102.9	W. Wollaston	(1803)
Rubidium	(Rb)	37	85.5	R. Bunsen & G. Kirchhoff	(1861)
Ruthenium	(Ru)	44	101.1	K. Claus (or Klaus)	(1844)
Samarium	(Sm)	62*	150.4	L. de Boisbaudran	(1879)
Scandium	(Sc)	24	45.0	L. Nilson	(1879)

Selenium	(Se)	34	79.0	J. Berzelium	(1817)
Silicon	(Si)	14	28.1	J. Berzelium	(1824)
Silver	(Ag)	47	107.9	....	Prehistoric
Sodium	(Na)	11	23.0	H. Davy	(1807)
Strontium	(Sr)	38	87.6	H. Davy	(1808)
Sulphur	(S)	16	32.1	....	Prehistoric
Tantalum	(Ta)	73	181.0	A. Ekeberg	(1802)
Technetium	(Tc)	43	(99)	E. Segre & C. Perrier	(1937)
Tellurium	(Te)	52	127.6	M. von Reichenstein	(1782)
Terbium	(Tb)	65*	158.9	C. Mosander	(1843)
Thallium	(Tl)	81	204.4	W. Crookes	(1861)
Thorium	(Th)	90	232.0	J. Berzelium	(1828)
Thulium	(Tm)	69*	168.9	P. Cleve	(1879)
Tin	(Sn)	50	118.7	....	Prehistoric
Titanium	(Ti)	22	47.9	W. George	(1791)
Tungsten (Wolfram)	(W)	74	183.9	G. & F. d'Ethuyar	(1783)
Uranium	(U)	92	238.0	E. M. Peligot	(1841)
Vanadium	(V)	23	51.0	A. Delrio	(1801)
Xenon	(Xe)	54	131.3	W. Ramsay & M. Travers	(1898)
Ytterbium	(Yb)	70*	173.0	C. Marignac	(1878)
Yttrium	(Y)	39	88.9	J. Gabolin	(1794)
Zinc	(Zn)	30	65.4	....	Prehistoric
Zirconium	(Zr)	40	91.2	M. Klaproth	(1789)

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* *Rare Earths:* Fifteen elements from atomic number 57 to 71 are collectively known as Rare Earths because they are remarkably similar in their chemical behaviour.

Element 104. In 1969, the Russian scientists at Dubna announced that they had succeeded in synthesising element 104 which they named Kurchatovium in honour of physicist, I. V. Kurchatov. American scientists at Berkeley synthesised element 104 by a different method and challenged the Russian finding, naming their discovery Rutherfordium in honour of Lord Rutherford

Element 105. In 1970, element 105 was produced by bombarding a minute target of Californium (98) with a beam of high-energy Nitrogen-15 nuclei. When the nitrogen-15 nuclei was absorbed by Californium, four neutrons were emitted and a new atom was found. It was named Hahnium, after the German scientist, Otto Hahn.

Both these elements were discovered by a team of scientists led by Albert Ghiorso, at the Lawrence Radiation Laboratory of the University of California.

54. TEMPERATURE SCALES

Three systems of temperature measurement are now in use—the *Celsius* scale, the *Fahrenheit* scale and the *Kelvin* scale.* The Celsius scale was worked out by the Swedish physicist and astronomer *Anders Celsius* in 1742. It appears to have been revised by another Swedish physicist *J. P. Christen*. This scale was originally known as the *Centigrade*. It was re-named Celsius scale in honour of its inventor Celsius. The Fahrenheit scale was devised by the German-born physicist *Gabriel Daniel Fahrenheit* (1686-1736) around 1715. The Kelvin scale was pioneered by the British physicist *William Thompson Kelvin* (1824-1907), later *Lord Kelvin*.

The International System of Units recognises the Celsius and Kelvin sca [illegible]

The Kelvin scale is derived from thermodynamics and is of special importance [illegible] scientists. The scale generally used by all is the Celsius. The unit of temp [illegible] adopted by the SI is based on t [illegible] *Point of Water*, that is, the tem [illegible] which solid, liquid, and gaseou [illegible] all in equilibrium. The triple [illegible] been defined as 273.16K† (Kelvin) [illegible] is equivalent to 0.01°C. Zero [illegible] is the *Absolute Zero*. This correspon [illegible] -273.16° Celsius and -459.6 [illegible]

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* In 1730 Rene Reau [illegible]

† [illegible]

Absolute Zero[*] is a thermodynamic concept, that is to say, it is based on heat energy. It is the point at which molecules have no heat energy. At this point all motion stops. Even atomic particles slow down.

Conversion Formulae

Kelvin to Celsius	$K=C+273.16$
Celsius to Fahrenheit	$C=F-32\times\frac{5}{9}$
Fahrenheit to Celsius	$F=C\times\frac{9}{5}+32$

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[*] In classical thermodynamics, all atomic motion was thought to stop at zero temperature, that is to say, the atoms would come to rest with zero kinetic energy. This idea has been modified by quantum machanics. In quantum mechanics, the motionless state is not possible because it would violate the uncertainty principle formulated concisely by Werner Heisenberg.

The uncertainty principle implies that even if the temperature of a substance could be reduced to absolute zero, the atoms would retain some small quantity of kinetic energy (the zero point energy) and would therefore remain in motion (the zero point motion)

Source: Scientific American

55. CRYOGENICS

Cryogenics is one of the youngest sciences, having come into existence only in the 20th century. The name 'Cryogenics' is derived from a Greek word meaning, 'productive of cold'. Cryogenics deals with the production of 'very low' temperatures and the study of their physical and technological consequences. 'Very low' temperatures are generally taken to mean temperatures below–150°C and thereabouts. Absolute Zero clearly belongs to the domain of cryogenics. It is apparently unattainable on earth.

The lowest temperature that we have reached or rather produced on earth is only one-millionth of a degree above Absolute Zero. Scientists the world over are continuously working at reaching at least one-hundredth of the degree Absolute. This is a world far below the freezing point as we understand it. In this sub-freezing world strange things happen. All known elements freeze solid, except helium which remains liquid. Rubber becomes so brittle that it shatters like glass. Lead rings like a bell when struck. Air freezes into a solid block. All these happen not at the point of Absolute Zero but within about 10 points above it.

Helium. Helium, the second lightest of all gases (the lightest is hydrogen), has proved to be a most slippery and recalcitrant gas. Curiously enough, this gas was first found in 1868 in the sun's atmosphere[‡] by Sir Norman Lockyer, the British astronomer, through the spectroscope. In 1895 Sir William Ramsay found it on earth in the uranium ore—*clevite*. Later it was established that helium is found in all radioactive minerals and that it is released on earth by the radioactive decay of these minerals. Ordinary air contains 1 part in 200,000 of helium. Helium has several usable advantages. It is inert and non-inflammable. It is used for inflating air-ships. It resisted all attempts at liquefaction till 1908, when it succumbed to Dr. Kamerlingh-Onnes at Leyden. Thus, it is the last gas to be liquefied. Liquid helium has many remarkable properties which are not wholly understood as yet. It is indispensable in cryogenics as a medium to cool other substances to temperatures near the Absolute Zero. It is the only element that we know of which refuses to solidify even in the dangerous vicinity of Absolute Zero.

One of the surprises at low temperatures is *Superfluidity*. If liquid helium is poured into a flask, separated into two chambers by a partition, it seeps through the solid partition to become level in both chambers.

Another surprising phenomenon is *superconductivity*. Superconductivity was first discovered at the University of Leyden in 1911 by Dr. H. Kamerlingh-Onnes, who was awarded the Nobel Prize in 1913 for his earlier work of liquefying helium. However, it was only in 1957 that the theory caught up with experiment. Nobel Prize winner Dr. John Bardeen (1956) of the University of Illinois and his associates presented the first theory of superconductivity in 1957. The theory is based on quantum mechanics and is highly technical. Some 300 materials—25 elements and the rest alloys or compounds—are now known to be superconductors. The application of superconductivity (that is, the total disappearance of electrical resistance) to electric power engineering promises to increase capacity, reduce cost and improve reliability of power grids. A transmission line made of super-conducting niobium-tin and roughly the diameter of arm, could carry as much power as the peak load now being used in the whole of the United States.

[‡] The name 'helium' is derived from ***helios*** meaning the sun.

Cryogenics has thousands of other applications. Rapid freezing by liquid nitrogen, for instance, confers improved taste, texture, aroma, nutritive value and appearance to food articles besides reducing degradation by bacteriological, enzymatic, oxidative and chemical reactions.

Cryogenic freezing systems, being more economical than conventional systems, could be very handy for refrigerated transporation of marine food, fruits, vegetables and other perishable foods.

In medicine, human blood used for transfusion in hospitals cannot normally be preserved beyond three weeks. A new blood freezing technique recently developed using liquid nitrogen could now be used for storing bloods for months or even years. Cryogenics could also be used to store marrow cells in marrow banks of hospitals. Cryosurgery has several advantages over normal surgery. It could be used to treat Parkinson's disease and other disorders of involuntary movement. Tumours could be frozen and removed with little loss of blood. Bloodless cryosurgery could also be used in tonsilectomies and in the removal of cataracts of the eyes.

Vast quantities of natural gases are burnt every year for want of economical methods for liquefying them in the country. The gases burnt at the refineries or oil fields could be liquefied by cryogenic methods and transported to the remote corners of the country for use by those who do not have the advantage of city gas lines. Liquid methane could reduce the cost of supersonic flights by about one-third.

Work on application of cryogenics is at present going on in nearly a dozen centres in India. They include the National Physical Laboratory, New Delhi, the Tata Institute of Fundamental Research, Bombay, the Indian Institute of Science, Bangalore, the Indian Association for Cultivation of Sciences, Jadavpur, the Physics Department of Delhi University, the Solid State Physics Laboratory, Delhi, and the Indian Institute of Technology, Kanpur.

56. MEDICAL SYSTEMS

Ancient Medical Systems. All ancient civilisations—Egypt, Babylon, India and China—developed their own systems of medicine. Egypt seems to have been the first and the best in the field. It had a fully developed medical system by the third millennium B. C.

We know very little of the Babylonian system and much less, almost nothing, of the Indus Valley system. The Indian system, as we know it, starts with the Rigveda (2000 B.C.). The earliest known medical treatise in China appeared around 450 B.C.

Egyptian System. The Egyptian system, like all other ancient systems, laboured under a heavy load of superstition and magic. Yet it developed many cures that have stood the test of time. Pain-killing drugs and sedatives were well-known to the Egyptians. Queen Nefretiti is portrayed in a bas-relief, as administering a pain-killing drug to her ailing husband, the Pharaoh. *Henbane*, a herb, which is known to us as a sedative source was first used by the Egyptians. *Onion* as a cure for scurvy and also as a cure for intestinal disorders is an old Egyptian prescription.

Chinese System. The Chinese system must have been many centuries old when the first great medical treatise appeared in China around 450 B.C. This treatise, unlike the Indian *Rigveda* and the later *Atharvaveda*, is an elaborate treatise on medicine, comparable to the *Susruta Samhita* or the *Charaka Samhita* of India. It included, among others, detailed descriptions of *acupuncture* which has received international publicity during recent times. Between 600 and 900 A.D. the Chinese system of medicine, known as *Han-Yi*, had spread to Korea and Japan and much of South East Asia.

Ancient China had developed many cures, some of which have come down to modern times. *Ephedra*, a herb which soothes coughs, was known to the Chinese, 4000 years ago. *Rhubarb* as a laxative was first used in China. *Pumpkin* seeds, another Chinese contribution, is a well-known wormridder. It is now found to be effective against snail fever also.

Graeco-Roman System. The Graeco-Roman system was almost entirely derived from the Egyptian system. Most of its cures are of Egyptian origin. To the Greeks, we owe the first revolutionary change in medical practice—the liberation of medicine from superstition and magic. *Hippocrates*, a Greek physician known as the Father of Medicine in the West, condemned the use of charms and chants in medicine. He laid down a code of conduct for medical practitioners. Scientific therapy started with Hippocrates.

Arab System. The Arabs revolutionised the science of medicine by effecting a synthesis of Indian medical system and the Graeco-Roman system. They passed on this knowledge to Europe. The influence of Arabic medicine on Europe was widespread and longstanding. *Qunun* (Canon) written by the Arab scholar *Avicenna* (11th cent. A. D.) became the primary text of medical studies in Europe and continued to be so as late as the 17th century.

Unani System. Under the Mughal Emperors, Arab medicine came to India. It took root in India, under the name of *Unani*, mainly because there was so much in common between the old Indian system and the new Unani system. The term *Unani* is derived from the Sanskrit *Yavana* meaning Greek. The Unani system continues to this day in India.

Indian System. The Indian System known as *Ayurveda* originated as far back as 2000 B. C. *Ayurveda* is a compound word in Sanskrit, meaning, literally, *the Science of Life*. Actually, it implies two connected ideas—the science of life and the art of living.

Ayurveda, unlike allopathy or homeopathy, does not swear by any particular principle of cure. Ayurvedic treatment covers all the principles of allopathy, homeopathy and naturopathy. "Thus", says Pandit Shiv Sharma, President of the Central Council of Indian Medicine, "the homeopathic opium which cures constipation and the allopathic opium which causes it, both fall within the Ayurvedic therapeutic measures".

According to Ayurveda, "there are three basic constituent complexes in the physiological system called *doshas*. They are *Vayu* or *Vata*, *Pitta* and *Kapha* or *Sleshma*. These terms, though literally they mean *wind*, *bile* and *phlegm* respectively, embrace much more. Between them, they sustain the whole body metabolism.

Good health implies an ideal balance between the three doshic factors. No true *mono-doshic* individual exists. It is the predominance of any particular *dosha* which marks the constitutional types of men. On this basis, humans are divided into three psychosomatic types, namely the *Vata-prakriti*, the *pitta-prakriti* and the *kapha-prakriti*.

The ayurvedic physician has to evaluate the *doshic* picture of the patient and find out what type of *tridosha* predominates and set right the imbalance by prescribing drugs, diets and practices.

Western System. The western system of medicine was later named *Allopathy* by *Hahnemann to* distinguish it from his own system *Homeopathy*. *Allo* from the Greek word *Alos*, means other or another, and implies the treatment of diseases by other drugs, that is, drugs having effects opposed to the symptoms. Homeo, from Greek word *Homos** means treatment by drugs having the same effects as the symptoms of disease. In other words, homeopathy (literally, similar suffering) is based on the principle "like cures like" while allopathy is based on the principle that opposites cure opposites.

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* Homeo is derived from the Greek word *homos* meaning 'the same', not the Latin word *homo* meaning 'man'.

20

Synthetic Vaccine

For the first time an effective vaccine has been made by chemical synthesis alone. The new vaccine promises to be about as potent against foot-and-mouth disease in animals as the current vaccine which is made from a killed virus. It is also safer and more convenient. This is good news for farmers all the world over, especially in those countries where this disease takes a heavy toll of cattle. The new vaccine has an additional advantage. The conventional killed virus can sometimes accidentally cause the disease itself. The new vaccine is perfectly safe in this regard.

The vaccine was synthesised by a team at the Research Institute of Scripps Clinic in California in association with British scientists, from a protein on the surface of the virus that causes this disease. Although the protein which forms the vaccine was produced last year (1981) by genetic engineering, the chemically synthesised vaccine is found to be more effective.

57. MILESTONES OF MEDICINE

I. ANCIENT MEDICINE

3000—2000 B. C. Egypt

I-am-hotep or **Imhotep** (he who comes in peace) circa 2980 B. C. is the legendary founder of Egyptian medicine. He was later deified as the god of medicine. Around 2500 B. C. we find evidence of surgical operations in Egypt. By 2000 B. C. Egypt had a highly developed system of medication. They embalmed their dead and prepared drugs to combat diseases and essences to improve health.

2000—1000 B. C. India

Rigveda (2000 B. C.) marks the beginning of the Indian system of medicine. Ayurveda is said to be founded by the sage Atreya. Medicine was considered part of the Vedas or scriptures. Rigveda contains two basic concepts of Ayurveda–the concept of *tridhathu** (three bodily humours) and the idea of rejuvenation of the aging body.

Atharvaveda (1000 B. C.) Mentions the twin aims of medical science as health and longevity and curative treatment. The concept of *tridhathu* is amplified. Vayu, Pitta and Kapha, are regarded as the pathological conditions (tridosha or tridhathu). Hygiene and dietetics are considered important in treatment. Beneficial effects of milk are described in detail.

800—500 B. C. India

Bhela Samhita. A codification of medical knowledge scattered through the Vedas (800 B. C.).

Agnivesa Samhita. A codification by Agnivesa, said to be a disciple of Atreya, which became the basis of the later Charaka Samhita (700 B. C.).

Kasyapa Samhita. A treatise by Kasyapa mainly dealing with paediatrics (600 B. C.).

Chivaravastu (author or authors unknown) mentions Prince Jivika, the court physician of Bimbisara, King of Magadha, as a marvellous physician and surgeon. He is credited with such difficult operations as piercing the skull to operate on the brain, surgery of the eyes etc. and medical treatment of dropsy, internal tumours and varicose veins (500 B. C.).

500—200 B. C. Greece

Alcmaeon of Croton held that the brain was the central organ of sensation and intellectual activity. (500 B. C.).

Hippocrates. Father of Western medicine-Beginning of experimental medicine–a rational conception of diseases as due to natural causes–minute observation and careful interpretation of symptoms—accurate description of many diseases and their treatment (460-370 B. C.).

5th Cent. B. C. China

Huangdi Neiching (T) HUANGDI (A) c. 450 B. C. Treatise on Medicine. The first book on medicine in China covering all that was known in medicine at that time–aetiopathology, diagnosis, prognosis and therapy.

C. 350 B. C. Alexandria

Herophilus, the first great human anatomist, was also the greatest physician since Hippocrates. **Erasistratus** a younger contemporary of Herophilus and **Eudemus** practised human dissections* and made experiments on animals. This trio made Alexandria, the most famous centre of medicine in the world.

200—100 B. C. India

Patanjali. Exposition of the *yoga* system of philosophy of mental and physical discipline–the starting point of yoga therapy of later centuries (c. 200 B.C.)

Charaka Samhita. The first classical exposition of Indian medicine deals with almost all branches of medicine–anatomy, physiology, aetiology†, prognosis (prediction of the course of a disease), pathology and treatment, procedure and sequence of medication– an extensive materia medica of more than 600 drugs. This treatise formed the basis of the *Atreya school* of medicine in India (c. A. D. 100).

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* According to Pandit Shiva Shama, President of the Central Council of Indian Medicine, *tridhathu and tridosha* can be regarded as synonymous. They indicate 'three basic constituent complexes in the physiological system'.

† The branches of pathology, which deal with the causes of disease.

A. D. 100—200 Rome

Celsus. A treatise on medicine and surgery as it obtained in Alexandria and Rome (c. A. D. 100)

Galen. (A. D. 131-201). The greatest figure in western medicine since Hippocrates. Systematised Greek anatomical and medical knowledge and united the divided schools of Graeco-Roman medicine. He dissected animals and human bodies and discovered many new facts in anatomy and physiology. Galen's ideas ruled medical science in Europe till the 16th century.

A. D. 200—300 India

Susruta Samhita, as redacted by *Nagarjuna*. (The original samhita is much older but is not traceable). It is another great treatise on Ayurveda, like the Charaka Samhita. Susruta is described as a disciple of *Dhanwantari*, a sage of remote antiquity. The original Samhita appears to have been revised and considerable additions made by Nagarjuma. The emphasis is on surgery.

It describes more than 300 operations, 43 different surgical processes and 121 different types of instruments. The materia medica is also extensive, covering more than 650 drugs of animal, plant and mineral origin. The *Rasachikitsa* system (treatment by mercury) of later days is anticipated and recognised in this Samhita. This treatise forms the basis of *Dhanwantari school* (A. D. 300).

A.D. 500-600 India

Vagbhata (c. 550) writes *Ashtanga Hridaya* (ashtanga = eight limbs & hridaya = by heart). The eight limbs refer to the eight traditional branches of Ayurvedic knowledge, that is, 1. Therapeutics, 2. Surgery, 3. Eye, ear nose and throat 4. Mental and supernatural diseases 5. Infantile diseases and their treatment, 6. Toxicology, 7. Arresting physical and mental decay and 8. Rejuvenation or re-gaining lost virility, potency, and procreative ability.

This book is the most concise and scientific exposition of Ayurveda. It is in verse form, making it easy to memorise. It incorporates the teachings of the sages *Atreya* and *Dhanwantari* and the *rasayana school* of medicine (see below). It is distinguished by its knowledge of chemical reactions and laboratory processes. This book has been translated into foreign languages.

A. D. 600—750 India

Sodhala (c. 700) Two treatises, *Gadanigraha,* a medical treatise and *Sodhala Nighantu,* a medical lexicon.

Vrdukunta (c. 750) writes *Siddhayoga,* the earliest treatise on *rasa chikitsa* (rasa = mercury, chikitsa = treatment) now existing intact. The rasa chikitsa system considers mercury as the king of all medicines. *Siddhayoga* explains the various preparations of mercury and other metals, alloys, metallic compounds, salts and sulphur.
This school of medicine is called the *Siddha school*. All their medicines are made of metals, salts and sulphur. The Siddha school is supposed to be a continuation of the pre-Aryan medical system in India. It is popular in eastern and southern India.

Siddha Nagarjuna Two treatises on the Siddha system, *Rasaratnakara* and *Arogyamanjari.*

A. D. 700—800 India

Madhavacharya writes *Madhava Nidana.* This is a compilation from the earlier works of *Agnivesa, Charaka, Susruta* and *Vagbhata.* It is specially useful as a chemical guide to preparations. It is famous all over India as the best Auyrvedic work on the diagnosis of diseases.

II. MEDIAEVAL MEDICINE

A. D. 800—1300 Middle East

Translation of Indian Medical classics into Arabic– *Susruta Samhita* as *Kilal Samural–HInd-I* of *Susrud,Charaka Samhita* as *Sarag, Ashtangahridaya* as *Astanker* and *Madhava Nidana* as *Badan.* (A.D. 800—900).

Ali b. Rabban compiles *Firdausi Hikmat* (Paradise of Wisdom) a synthesis of Greek and Indian medicine.(A.D. 850).

Abu Ali Husain b. Abdulla, better known as *Avicenna*, published 16 medical books in Arabic, the chief of which is *qunun* (canon). Avicenna represents the high watermark of Arabic medical knowledge. His Qunun became the text book of medical study in Europe and continued in use as late as 1650. (A.D. 980-1036).

A.D. 800—1300 India

A number of treatises were written in India during this period. *Arkaprakasha*, a book on tincture extraction, *Sarngadhara Samhita*, *Chikitsa Samgraha* and *Yogaratnakara* are the better known among them.

This period also witnessed a spurt of writing on the Rasachikitsa system. *Rasahridaya* by Govinda Vagbhata, *Rasaratnakara* by Siddha Nityananda, *Rasaratna Samukhya* by Vagbhata (not to be confused with Vagbhata who wrote Ashtangahridaya), *Rasarnava* by Sambhu, *Rasendra Chintamani* by Ramachandra and *Rasendra Choodamani* by Somadeva.

A.D. 1300—1600 Europe

Mondino (Italy) publishes *Anatomia*, the first book on Anatomy (1316).

Paracelsus, (1493-1541) a Swiss doctor was the first to break away from the Galenic school. He popularised the use of chemical drugs to cure diseases —the beginning of *chemotherapy*.

Andreas Vesalius (1515-1564), an independent investigator published *De Humanis Corporis Fabrica* (1543), the first proper book on *anatomy* based on his own observations.

A.D. 1300—1600 India

Bhavamisra writes *Bhavaprakasha*. This is the most renowned Indian treatise during this period. It contains an exhaustive list of diseases and their symptoms and a complete list of drugs, including many not mentioned in the earlier works. It includes aetiology and treatment of syphilis, a disease brought into India by Portuguese seamen.

Other works of this period are *Chikitsalika* by Trisata, a manual on diagnosis, *Chintamani* by Ballabhendra on aetiology and diagnosis and *Vaidyamruta* by Moreswara on the treatment of diseases.

Another class of works produced during this period are medical lexicons by Madanapala, Nagahari, Bimapala and Rajavallabha.

III MODERN MEDICINE

1600—1700 Europe

William Harvey (1578-1657) discovers circulation of blood. His book *Ectiato Anatimica de Mota Cordis et Sanguines* was published in 1628.

Jan Baptista Van Helmont (Flemish) (c. 1648) founds biochemistry. He invented the name 'gas' for airy elements.

Marcello Malpigi (c. 1661) discovers capillaries as the connecting links between veins and arteries.

Borelli (c. 1670) explains the mechanics of breathing and muscular contraction.

1700—1800 Europe

Richard Lower publishes *Tractus de Corde* (1699) showing that blood changed its colour from dark purple to bright red in the lungs.

Leeuwenhock (Dutch) discovers bacteria under the microscope (1683).

J. F. Gall (1758-1828) demonstrates the real structure of the brain as the centre of the nervous system—beginning of the science of neurology.

Albrecht von Haller, Switzerland, (1757-66) Establishment of the science of physiology.

Edward Jenner-first successful vaccination 1796.

Marie Bichat (1771-1802), French, the study of tissues-founding of histology.

1800—1900 Europe and America

Kirchhoff discovers catalytic process (1812).

Rene Laennec (France) invents the Stethoscope (1819).

William Beaumount (America) establishes the function of pancreatic juice, expounds the work of liver and discovers vasomotor nerves (1822).

Karl Ernest Van Baer (1792-1896) founding of the study of embryology.

Cagniard de Latoar identifies fermenting agent (1838).

Schwann Theodore (German) independently discovers the same agent (1838).

Matthias Schleiden, and Theodore Schwann (Germany) explain cells as units of life-founding of cytology (study of cells) (1838-39).

Crawford Long (America)-use of ether as an anaesthetic during surgery (1842).

James Simpson (Britain)-use of chloroform as an anaesthetic (1847).

Louis Pasteur-microbes,cause of diseases —process of pasteurisation-discovers vaccines for anthrax and rabies (1860).

Joseph Lister-use of carbolic acid as an antiseptic for surgery (1865).

Ferdinand Cohn-founding of bacteriology (1872).

Hansen (Norway)-discovery of leprosy bacillus (1873).

Robert Koch-discovery of cholera, T. B. germs (1877).

Kuhne-names catalysts as enzymes(1878).

Edwin Klebs and Friedrich Loffeter-discovery of diphtheria germs (1883-84).

Camillo Golgi, Italy,-Founding of neuroanatomy.

Laveran-Identifies malaria germs (1880).

Schiff-Discovers the function of the thyroid (1884).

Metschnikott- Discovers phagocytes-white corpuscles that fight infection (1884).

Rubner-Determines heat-value (calories) of protein and carbohydrates (1885).

Dreser (German)- Discovery of aspirin (1889).

Dimitri Ivanovski- Discovery of virus in tobacco mosaic-founding of the science of virology (1892).

M. Bajerinck- Dutch (1892-95) do independently.

Sigmund Freud- Founding of psychoanalysis (1895).

Paul Ehrlich- Founding of serology (1884-1915).

Emilson Behring (German) and S. Kitasato (Japanese)- Discovery of antitoxins-science of immunity (1890).

Schafer and Oliver (Britain) Discover adrenaline, the first hormone to be discovered (1894).

1900 and after

Takamine (Japan)-Isolation and analysis of the hormone adrenalin (1901).

Bayliss and Starling-Discovery of hormones- founding of the science of endocrinology (1902).

Einthoven (Dutch)-Electro-cardiograph (1903).

August Wasserman and others- Development of specific test for syphilis (1906).

Sir F. G. Hopkins and Sir W. M. Fletcher-Analysis of muscle contraction- breakdown of glycogen into lactic acid (1907).

J.Nicolle (France)-Typhus vaccine(1909)

Steinach-Identification of sex hormones (1910).

Sir F. G. Hopkins-Discovery of accessory food factors, later named vitamins (1912).

Holst, Froelich (Norway)-Vitamin C. (1912).

McCollum and M. Davis (USA)-Vitamin A (1913).

McCollum (USA)-Vitamin B (1916).

Landsteiner-Synthetic antigens to produce antibodies to fight infection (1917).

Kendall-Identification of thyroxin, thyroid gland secretion (1919).

Banting and Best- Insulin for diabetic therapy (1922).

Mc Collum (USA) Vitamin D (1922).

Collip-Isolation of parathyroid hormone (1924).

George Minot and William Murphy-Discovery of Vitamin B_1 (liver extract) for treatment of anaemia (1926).

Aschheim and Zonelek- Discovery of oestrogen — Female sex hormone (1927).

Philip Drinker and Louis Shaw- Invention of the iron lung for artificial respiration (1928).

Alexander Fleming-Discovery of penicillin (1928).

Dale and Dadley- Extract from animal spleen,the hydrolysing enzyme-acetyle chlorine (1929).

Gerhard Domagk (Germany)-First use of sulfa drugs in therapy (1932).

Kendall (US)- Cortisone (1936).

Karl Landsteiner- Discovery of the Rh-factor in blood (1940).

Selman Waksmann (German)- Discovery of streptomycin (1943).

Hoffman (Swiss)- LSD (1943).

Kolf (Dutch)- Kidney Machine (1944).

Burkholder(USA)- Chloromycetin(1947).

Dugger (USA)- Aureomycin (1948).

Armour & Co. (USA) - Synthetic ACTH (1949).

Philip Hench and others- Use of cortisone in therapy (1949).

Jal Vakil (India)-Reserpine (1949).

Finlay and others (USA)-Terramycin (1950).

Henry Swan(USA)-Establishmentof cryosurgery 1953 (see Cryogenics, supra).

Walton Lillehel (USA)- Open heart surgery (1953).

Jonas Salk- Discovery of poliomyelitis (hypodermic) vaccine (1954).

Albert Sabin (USA)- Poliomyelitis (oral) vaccine.

Enders, John (USA)- Measles vaccine (1954).

Pincus (USA)-Contraceptive pills (1955).

Michael de Bakey (USA)- First use of artificial heart during heart surgery (1963).

Christian Barnard (S. Africa)- First surgical transplant of the human heart (1967).

George Eldermann & Co.-Discovery of the structure of gammaglobin, one of body's defence weapons (1969).

George Eldermann & Co. (USA) & **Rodney R. Porter** (UK) structure of antibodies (1969).

Gertrude Henli & Co.-discovery of the viral cause of multiple sclerosis(1976).

58. TIME SYSTEMS

Early Timepieces. The earliest instruments for measuring time included many devices like the sun dial and the water clock which were used in Egypt. These instruments were crude. In the 2nd century BC, Ctesibius, a Greek engineer of Alexandria, re-designed the ancient Egyptian water clock and made it popular. The improved water clock was the best of the ancient timepieces. During the Middle Ages mechanical clocks run by falling weights came into vogue. These were more convenient than the water clocks but no more accurate. Both erred by as much as half an hour per day.

In 1656, Christiaan Huygens, a Dutch physicist, built the first working model of a pendulum clock. This proved to be of momentous importance in time keeping. It was improved by William Clement, an English clock maker, in 1670. He introduced the use of a long pendulum that beat in a one-second rhythm and was more regular than the short pendulum clock first built by Huygens. This clock known as the 'grandfather clock' eclipsed all other models. Spring-powered watches soon followed. These clocks and watches ushered in an era of fairly accurate time keeping. Thereafter, all attempts centred round the evolution of more and more dependable devices for attaining greater accuracy.

Precision. Normal error in earlier clocks and watches came to around ten minutes a day. By the first quarter of the 20th century the *free pendulum clock* had reduced the error to a thousandth of a second per hour. The latest device, the *quartz crystal clock*, has brought down the error to a thousand millionth of a second per hour.

Time Units. In 1884 the second—the lowest unit of time—was defined as $\frac{1}{86,400}$ of the time that the earth took to complete one rotation on its own axis or $\frac{1}{86,400}$ of a day of 24 hours. This, of course, meant that the 24-hour day was made up of 86,400 seconds.

But the earth wobbles as it rotates. This wobbling leads to fluctuations in the time of rotation. It was therefore decided in 1960 to abandon the period of rotation as the primary unit (that is, a day of 24 hours), and to adopt the period of revolution (of the earth round the sun) as the basis of calculations. The second was thus re-defined as $\frac{1}{31,556,925.9747}$ of the time that the earth took to complete one revolution round the sun. A year of 365 days and odd, thus consisted of about 31.5 million seconds.

But the observations on which we rely in calculating the exact period of revolution are themselves vitiated by the properties of the earth's atmosphere. Besides, mechanical clocks and watches became unreliable over some years due mainly to wear and tear. On the whole, our precisely calculated 'second' bade fair to accumulate sizable errors over a period of time. This led us to look for a more reliable recorder of time. The Atomic clock thus came into being.

Atomic Time. In 1967 the *General Conference* on *Weights & Measures* recognised the atomic second as determined by the *cesium* (caesium) *atom clock* as the unit of time under the International System of Units (SI). The atomic second is defined as the time taken by the cesium electron to complete 9,192,631,770 spins. This definition was based on the experiments with the cesium atom conducted for 3 years by William Markowitz at the US Naval Observatory in Washington, DC, and by Louis Essen at the National Physical Laboratory in England. The definition is not as accurate as it looks because the cesium electron may sometimes take more spins and sometimes less spins than the defined norm. The deviation, however, is only a few spins either way, that is, a few spins more or less than 9192 million spins. This is insignificant.

The atomic clock has two specific advantages. It is not affected by the vagaries of the atmosphere nor by the fluctuations in the rotation of the earth. The latter has become important in recent years. For, it has been observed from 1970 onwards that the earth is slowing down in rotation by nearly a second every year. Since this error has been noticed, clocks all over the world are being corrected at the beginning of every year to conform to the atomic time. The atomic clock developed by the British National Physical Laboratory has achieved a very high degree of accuracy. It is accurate to one second in 300 years.

Co-ordinated Universal Time. Since January 1972, a new standard of time called the *Co-ordinated Universal Time* (UTC) has also been maintained in Paris, the headquarters of the General Conference on Weights & Measures. This is not based on any single atomic clock but on the average of atomic clock readings from 18 timing centres around the world. The UTC does not gain or lose more than one hundred millionth of a second per day. This has whittled down the infinitesmal error of the atomic clocks to the vanishing point. It is expected that the UTC will remain absolutely correct for a quarter million years.

Standard Time. The system of Standard Time was introduced to co-relate the time systems of various countries on an international basis. For this purpose the earth was divided into 24 longitudinal zones, each zone being 15 degrees of an arc or one hour apart in time. The zero zone is centred at Greenwich (London) which gives the GMT or the Greenwich Mean Time. The 12th zone is divided by the 180th meridian, the International Date Line. The zones to the east of this line are numbered from 1 to 12 with the prefix *minus* indicating the number of hours to be subtracted to obtain the Greenwich Time. The zones to the west are similarly numbered with the prefix *plus* which shows the number of hours that must be added to get the Greenwich Time.

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Static second

Standard clocks the world over remained static for a second at the midnight hour tonight to correct the time difference between the astronomical and the atomic clocks.

Since the introduction of "leap seconds" in 1972, 20 corrections have been made so far to the atomic clock which was slower than the astronomical one.

Scientists at the National Physical Laboratory's time and frequency section here said there has been a total difference of 20 seconds between the two clocks till date. All these had been corrected on the directive from the International Time Bureau in Paris.

—U. N. I. Report New Delhi,
June 30, 1981.

The following zones are fast on Greenwich Time by the number of hours indicated in brackets:

Fiji, New Zealand etc. (12 hrs.)
New Caledonia, New Hebrides etc. (11)
Queensland, Tasmania etc. (10)
Japan, Korea etc. (9)
China, Hongkong, Philippines etc. (8)
Singapore (7½)
Java, Thailand etc. (7)
Burma, Cocos Keeling Islands (6½)
Bangladesh (6)
India, Sri Lanka, Andaman and Nicobar Is. (5½)
Pakistan (5)
Mauritius, Seychelles etc. (4)
Iran (3½)
Iraq, Ethiopia etc. (3)
Turkey, Greece, Bulgaria etc. (2)
Sweden, Norway, Denmark etc. (1)

The following areas are slow on Greenwich Time by the number of hours indicated:

Iceland, Madeira etc. (1)
Azores, Cape Verde etc. (2)
Greenland (excluding Scoresby Sound and Thule) and Eastern Brazil (3)
Newfoundland, Labrador, Dutch Guiana and Uruguay (3½)
Canada (East of 68°W), Greenland (Thule area), Puerto Rico etc. (4)
Canada (from 68°W. to 85°W. North) Jamaica, Bahama, Bahama Is., Cuba, Haiti, Peru, Panama etc. (5)
Canada (from 85° W. North) Costa Rica, Salvador, Honduras, Guatemala. Nicaragua, Central parts of USA and parts of Mexico (6)
Canada (from 102° W. to 120° W.), mountain States of USA and parts of Mexico (7)
Canada (West of 120° W.), Alaska, (south east) Western States of USA and parts of Mexico (8)
Alaska (north of Cross Sound), Yukon, Christmas Is. (9)
Alaska (from 141°W.), Hawaii etc. (10)
Aleutian Is., Alaska (west coast), Samoa, Midway Is. (11)

International Date Line. The Date line is a zigzag line that coincides more or less with the 180th meridian. When the Date line is crossed to the west the date must be advanced by one day. When the Line is crossed to the east, the date must be set back by one day. The Line is deflected between north latitudes 48 and 75 with the result that all Asia lies to the west of the line.

Twenty-four-Hour Time: The 24-hour-time is now being increasingly used especially by railways and other transport organisations. Its great advantage is that it dispenses with the suffixes *a.m.* and *p.m.* In the 24-hour system, day begins at midnight, the zero hour, and the hours that follow are consecutively numbered from 0 to 23.

59. NUMERALS

Arabic Numerals. The numerals, now in everyday use, are called Arabic numerals, because it was from the Arabs that these numerals spread to Europe. Actually, they are Indian in origin and should rightly be called Indian numerals. The concept of zero and the digital system (including decimals) are India's contributions to the science of numerals. The Arabs adopted the Indian system. The Europeans got it from the Arabs (See *Landmarks of Science*).

Among the authors, who were instrumental in transmitting Indian mathematical knowledge from Arab sources to Europe, the most famous is Leonard of Pisa (A.D. 1202). Other important authors were: John of Seville (1135), Adelard of Bath (1142), Robert of Chester (1142), Villedien (1240) and Sacrabosa (1242).

Roman Numerals. Roman Numerals are those used by the ancient Romans. They are letters converted into numbers I=1, V=5, X=10 etc. They do not follow the digital system of Arab numerals. The general rules of Roman numerals are the following: (1) Repeating a letter repeats its value: XX=10+10=20. (2) A letter placed after one of greater value adds thereto: VI=5+1=6. (3) A letter placed before another of greater value subtracts therefrom: IV=5—1=4. (4) A dash line over a numeral multiplies its value by thousand: $\overline{X}=10\times1000=10{,}000$.

Higher Arabic Numeral. Some high Arabic numerals cause a lot of confusion, when used as words. The classic instance is *billion*[*] which in U.S. is equal to *a thousand million* and in Britain to *a million-million*.

Arabic and Roman Numerals. Arabic numerals and their corresponding Roman numbers are given below.

Table 46

1	I	11	XI	30	XXX
2	II	12	XII	40	XL
3	III	13	XIII	50	L
4	IV	14	XIV	90	XC
5	V	15	XV	100	C
6	VI	16	XVI	200	CC
7	VII	17	XVII	400	CD
8	VIII	18	XVIII	500	D
9	IX	19	XIX	900	CM
10	X	20	XX	1000	M

Multiples

$\overline{V}$ 5000; $\overline{X}$ 10,000; $\overline{L}$ 50,000; $\overline{C}$ 100,000; $\overline{D}$ 500,000; $\overline{M}$ 1,000,000.

Table 47

Higher Numerals

Number	*US & France*	*UK & Other European Countries*	*India*
1 & 5 zeros	One Hundred Thousand	One Hundred Thousand	One Lakh
,, 6 ,,	Million	Million	Ten Lakhs
,, 7 ,,	Ten Million	Ten Million	One Crore
,, 8 ,,	Hundred Million	Hundred Million	Ten Crores
,, 9 ,,	Billion	Milliard (Thousand Million)	Hundred Crores
,, 12 ,,	Trillion	Billion	....
,, 15 ,,	Quadrillion	Thousand Billion	....
,, 18 ,,	Quintillion	Trillion	....
,, 21 ,,	Sextillion	Thousand Trillion	....
,, 24 ,,	Septillion	Quadrillion	....
,, 27 ,,	Octillion	Thousand Quadrillion	....
,, 30 ,,	Nonillion	Quintillion	....
,, 33 ,,	Decillion	Thousand Quintillion	....

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[*] The word 'billion' wherever it is used in this book means a 'thousand million' (American sense) unless otherwise indicated.

60. INTERNATIONAL UNITS (SI)

(I) **Imperial and Metric Systems.** During the first half of the present century, there were two widely used systems of Weights and Measures—the Imperial System and the Metric System. The Imperial System prevailed in the British Empire and the English-speaking countries generally, including the United States. The Metric System was followed by France and other European countries and their colonies and dependencies.

Imperial System. The Imperial System was derived from the old Anglo-Saxon measurements. They were rough and ready units based on standards that were readily available everywhere—the human hand, for example. In their very nature, they could never be precise and, worse, they changed from person to person and from place to place. The *inch* was the 'knuckle of the thumb'. A *yard* was the distance from the tip of *King Edgar's* nose to the tip of the middle finger of his outstretched hand. An *acre* was the amount of land that could be ploughed in a day by a yoke of oxen. The *mile* came from the Roman legionaries. Their *milli* was 1000 paces or about 1618 yards. Paces being vastly different, the mile was eventually standardised at 1760 yards.

It was from such a conglomeration of odd units that the Imperial System of weights and measures was ultimately evolved. Although these basic units are now precisely defined, their conversion into larger or smaller units is an arithmetical torment. The mile, for example, is 12×3×220×8 inches and the short ton is 16×16×14×2×4×20 drams.

Metric System. The Metric System, unlike the Imperial System, was deliberately thought out. This system was adopted by France in 1790 and propagated in other European countries by Napoleon. As adopted in France, the new unit of length was the *metre* which was equal to one-ten millionth of a quadrant of the Earth's meridian. The unit of weight or mass was the *kilogram*, which was defined as the mass of a cubic decimetre (0.1 c. metre) of water. The volume represented by a cubic decimetre of water was to be called a *litre*.

In 1870 France called together a convention to evolve a unified metric system. In 1875 the Treaty of the Metre was signed in Paris. The Treaty established an *International Bureau of Weights* and *Measures*, and a *General Conference on Weights* and *Measures*, which would meet periodically to adopt new definitions as the need arose.

In 1889 the metre and the kilogram were re-defined in terms of a bar of platinum-iridium alloy which was stored in a vault in Paris.

Today the metric system has been adopted by almost all nations.†

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† In 1971 the US decided to change over to the Metric System in ten years at the end of which the US will be predominantly but not exclusively on the Metric system. The Metric Conversion Act of 1975 legalised the change-over and set up the US Metric Board to supervise it.

Table 48

Table of Metric Weights and Measures

Linear Measure

10	Millimetres (mm)	=	1	centimetre	(cm.)
10	centimetres	=	1	decimetre	(dm.)
10	decimetres	=	1	metre	(m.)
10	metres	=	1	decametre	(dcm.)
10	decametres	=	1	hectometre	(hm.)
10	hectometres	=	1	kilometre	(km.)

Area Measure

100	square millimetres	=	1	square centimetre	
10,000	square centimetres	=	1	square metre	
100	square metres	=	1	are	(a.)
100	ares	=	1	hectare	(ha.)
100	hectares	=	1	square kilometre	(sq. km.)

Volume Measure

	one litre	=		0.001 cubic metre	
10	millilitres (ml.)	=	1	centilitre	(cl.)
10	centilitres	=	1	decilitre	(dl.)
10	decilitres	=	1	litre	(l.)
10	litres	=	1	decalitre	(dcl.)
10	decalitres	=	1	hectolitre	(hl.)
10	hectolitres	=	1	kilolitre	(kl.)

Weight

10	milligrams (mg.)	=	1	centigram	(cg.)
10	centigrams	=	1	decigram	(dg.)
10	decigrams	=	1	gram	(g.)
10	grams	=	1	decagram	(dcg.)
10	decagrams	=	1	hectogram	(hg.)
10	hectograms	=	1	kilogram	(kg.)
1000	kilograms	=	1	metric ton	(t.)

Cubic Measure

1000	cubic millimetres	=	1	cubic centimetre
1000	cubic centimetres	=	1	cubic decimetre
1000	cubic decimetres	=	1	cubic metre

Table 49

Double Conversion Tables for Weights and Measures

Note: The central figures (1 to 100) represent either of the two columns beside them, as the case may be.

Examples: 1 centimetre = 0.394 inch and 1 inch = 2.540 centimetres.
1 metre = 1.094 yards and 1 yard = 0.914 metre. 1 kilometre = 0.621 mile and
1 mile = 1.609 kilometres.

Centimetres		*Inches*	*Metres*		*Yards*	*Kilometres*		*Miles*
2.540	1	0.394	0.914	1	1.094	1.609	1	0.621
5.000	2	0.787	1.829	2	2.187	3.219	2	1.243
7.620	3	1.181	2.743	3	3.281	4.828	3	1.864
10.160	4	1.575	3.658	4	4.374	6.437	4	2.485
12.700	5	1.969	4.572	5	5.468	8.047	5	3.107
15.240	6	2.362	5.486	6	6.562	9.656	6	3.728
17.780	7	2.756	6.401	7	7.655	11.266	7	4.350
20.320	8	3.150	7.315	8	8.749	12.875	8	4.971
22.860	9	3.543	8.230	9	9.843	14.484	9	5.592
25.400	10	3.937	9.144	10	10.936	16.094	10	6.214
127.000	50	19.685	45.720	50	54.681	80.468	50	31.068
254.000	100	39.370	91.439	100	100.361	160.936	100	62.136

Hectares		*Acres*	*Square Kilometres*		*Square Miles*	*Kilograms*		*Av. Pound*
0.404	1	2.471	2.590	1	0.386	0.454	1	2.205
0.809	2	4.942	5.180	2	0.772	0.907	2	4.409
1.214	3	7.413	7.770	3	1.158	1.361	3	6.614
1.619	4	9.884	10.360	4	1.544	1.814	4	8.818
2.023	5	12.355	12.950	5	1.931	2.268	5	11.023
2.428	6	14.826	15.540	6	2.317	2.722	6	13.228
2.833	7	17.298	18.130	7	2.703	3.175	7	15.432
3.237	8	19.769	20.720	8	3.089	3.629	8	17.637
3.642	9	22.240	23.310	9	3.475	4.082	9	19.842
4.047	10	24.711	25.900	10	3.861	4.536	10	22.046
20.234	50	123.554	129.498	50	19.306	22.680	50	110.231
40.468	100	247.108	258.995	100	38.611	45.359	100	220.462

Metric Tonnes		*Long Tons*	*Metric Tonnes*		*Short Tons*	*Litres*		*Pints*
1.016	1	0.984	0.907	1	1.102	0.568	1	1.760
2.032	2	1.968	1.814	2	2.205	1.136	2	3.520
3.048	3	2.953	2.722	3	3.307	1.705	3	5.279
4.064	4	3.937	3.629	4	4.409	2.273	4	7.039
5.080	5	4.921	4.536	5	5.512	2.841	5	8.799
6.096	6	5 905	5.443	6	6.614	3.409	6	10.559
7.112	7	6.889	6.350	7	7.716	3.978	7	12.319
8.128	8	7.874	7.257	8	8.818	4.546	8	14.078
9.144	9	8.858	8.165	9	9.921	5.114	9	15.838
10.161	10	9.842	9.072	10	11.023	5.682	10	17.598
50.803	50	49.211	45.359	50	55.116	28.412	50	87.990
110.605	100	98.421	90.718	100	110.231	56.824	100	175.980

Litres		*Gallons*	*Litres*		*Gallons*
4.546	1	0.220	31.822	7	1.540
9.092	2	0.440	36.368	8	1.760
13.638	3	0.660	40.914	9	1.980
18.184	4	0.880	45.460	10	2.200
22.730	5	1.100	227.298	50	10.999
27.276	6	1.320	454.596	100	21.997

Table 50
Simple Conversion Table
Indian Units

Tolas to grams										
Tolas	1	2	3	4	5	6	7	8	9	10
Grams	11.66	23.33	34.99	46.66	58.32	69.98	81.65	93.31	104.97	116.64
Seers to kilograms										
Seers	1	2	3	4	5	6	7	8	9	10
Kilograms	9.93	1.87	2.80	3.73	4.67	5.60	6.53	7.46	8.40	9.33
Maunds to Quintals										
Maunds	1	2	3	4	5	6	7	8	9	10
Quintals	0.37	0.75	1.12	1.49	1.87	2.24	2.61	2.99	3.36	3.73

(ii) International System. In 1954 the General Conference on Weights&Measures adopted one form of the Metric system as an internationally suitable system. In 1960 the system was named *System International de Unites* or the International System of Units, shortened to SI.

The system rests on 4 independent base units for *length, mass, time* and *temperature.* The units for length and mass are the *metre* and the *kilogram* respectively. The unit of time is the *second,* which has been defined in terms of the atomic clock. The unit of temperature is the degree Celsius (centigrade) or *Kelvin* as opposed to Fahrenheit. The conference has also accepted certain well-established units like the *minute* and the *hour* (units of time), the *degree,* the *minute* and the *second* as units of angular measurement and the *nautical mile* and *knot.*

The spectacular development of science and technology compelled the conference to define precisely, generally known units of measurement like length, mass or time. In addition, the conference had to adopt and define new units of measurement. The labours of the Conference in this regard led to the evolution of a complicated and highly technical international system. The definitions are stated in strict scientific jargon which the layman can hardly follow. A brief outline of the system is given below.

The S.I. Units are broadly divisible into three classes.

(1) Base units which form the foundations of the system.

(2) Derived units which are generally formed by a combination of Base units.

(3) Supplementary units which are used in angular measurment.

The special feature of the system is its coherence. A coherent set of units can be defined as one that arises, when a quotient or product of any two quantities leads to the unit of the resultant quantity. In other words, all units of the system hold together and are explicable in terms of other units.

International Units

Base unit	*Symbol*	*Year of Adoption*
METRE–Unit of length	m	1960
KILOGRAM–Unit of mass	kg	,,
SECOND–Unit of time	S	1967
AMPERE–Unit of electric current	A	1948
KELVIN–Unit of thermodynamic temperature	K	1967
CANDELA–Unit of luminous intensity	cd	,,
MOLE–Amount of substance*	mol	1971

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* One mole (mol) is an amount of substance in grams equal to its molecular weight.

Supplementary Units

RADIAN–Plane angle	rad	1960
STERADIAN–Solid angle	sr	1960

Base Units

Simple Expression in Terms of Base Units

Quantity	*Name*	*Symbol*
Area	square metre	m^2
Volume	cubic metre	m^3
Speed	metre per second	m/s
Density	kilogram per cubic metre	kg/m^3
Specific Volume	cubic metre per kilogram	m^3/kg
Luminance	candela per square metre	cd/m^2

The base units are defined as under:

Metre. The metre is the length equal to 1650763.73 wavelengths in vacuum of the radiation corresponding to the transition between the energy levels $2p_{10}$ and $5d_5$ of the crypton-86 atom.

Kilogram. It is the mass of the international prototype of the kilogram, which is in the custody of the 'Bureau International des Poids et Measures (BIPM) Sevres', near PARIS. Among the base units, the unit of mass is the only one whose name, for historical reasons, contains a prefix (Kilo).

Second. It is the duration of 9192631770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the Caesium-133 atom.

Ampere. It is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible cross section, and placed at a distance of 1 metre apart in a vacuum, would produce between these conductors a force equal to 2×10^{-7} newton per metre of length.

Kelvin. It is the fraction 1/273.16 of the thermodynamic temperature of the triple point of water.

Candela. It is the luminous intensity, in the perpendicular direction, of a surface of 1/600000 square metre of a black body at the temperature of freezing platinum under a pressure of 101 325 newtons per square metre.

Mole. It is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12.

Derived Units with Special Names

Quantity	*Name*	*Symbol*
Frequency	hertz	Hz
Force	newton	N
Pressure	pascal	Pa
Quantity of electricity	coulomb	C
Electric tension	volt	V
Electric resistance	ohm	Ω
Luminous flux	lumen	lm
Illuminance	lux	lx

Derived Units

These are classed as simple and complex

Table 51

Derived Units—Simple

Quantity	*SI Unit*	*Symbol*
Frequency	hertz	Hz
force	newton	N
pressure and stress	pascal	Pa
work, energy, quantity of heat	joule	J
power	watt	W
quantity of electricity	coulomb	C
electric potential, potential difference, tension, electromotive force	volt	V
electric capacitance	farad	F
electric resistance	ohm	Ω
electric conductance	siemens	S
flux of magnetic induction, magnetic flux	weber	Wb
magnetic flux density, magnetic induction	tesla	T
inductance	henry	H
luminous flux	lumen	lm
illumination	lux	lux

Table 52
Derived SI Units—Complex

Quantity	*SI Units*	*Symbol*
area	square metre	m^2
volume	cubic metre	m^3
density (mass density)	kilogramme per cubic metre	kg/m^3
velocity	metre per second	m/s
angular velocity	radian per second	rad/s
acceleration	metre per second squared	m/s^2
angular acceleration	radian per second squared	rad/s^2
rotational frequency	reciprocal second	s^{-1}
momentum	kilogramme metre per second	kg m/s
angular momentum	kilogramme metre squared per second	$kg\ m^2/s$
moment of inertia	kilogramme metre squared	$kg\ m^2$
moment of force	newton metre	Nm
surface tension	newton per metre	N/m
dynamic viscosity	newton second per metre squared	Ns/m^2
kinematic viscosity diffusion coefficient	metre squared per second	m^2/s
thermal coefficient oflinear expansion	reciprocal kelvin	K^{-1}
density of heat flow rate	watt per square metre	W/m^2
thermal conductivity	watt per metre kelvin	W/(mk)
coefficient of heat transfer	watt per square metre kelvin	$W/(m^2k)$
speciiic heat capacity	joule per kilogramme kelvin	J/(kg K)
entropy	joule per kelvin	J/K
specific entropy	joule per kilogramme kelvin	J/(kg K)
specific energy	joule per kilogramme	J/kg
specific latent heat	joule per kilogramme	J/kg
electric field strength	volt per metre	V/m
magnetic field strength	ampere per metre	A/m
luminance	candela per square metre	cd/m^2

Supplementary Units. The supplementary units are 1. Radian (rad) Plane angle and 2. Steradian (sr) Solid Angle.

Radian. It is the plane angle which, having its vertex at the centre of a circle, cuts off a length on the circumference of the circle equal to the radius of the circle.

Steradian. It is the solid angle which, having its vertex at the centre of a sphere, cuts off an area of the surface of the sphere equal to that of a square with sides of length equal to the radius of sphere.

Multiples and Subdivisions. Multiples and subdivisions (fractions) are indicated by appropriate prefixes. Multiples upto 1000 are indicated by the following prefixes—deca (10), hecto (100), and kilo (1000). Fractions up to 1000 are expressed as follows—deci (1/10), centi (1/100), and milli (1/1000).

For multiples and fractions above 1000 the following prefixes have been adopted.

Multiples

Tera = 10^{12} (1 followed by 12 zeros)
Giga = 10^9 ,, 9 ,,
Mega = 10^6 ,, 6 ,,
Kilo = 10^3 ,, 3 ,,
Hecto = 10^2 ,, 2 ,,
Deca = 10^1 ,, 1 ,,

Fractions

Deci = 10^{-1} (0.1)
Centi = 10^{-2} (0.01)
Milli = 10^{-3} (0.001)
Micro = 10^{-6} (Decimal point, followed by 5 zeros and 1)
Nano = 10^{-9} (Decimal point, followed by 8 zeros and 1)
Pico = 10^{-12} (Decimal point, followed by 11 zeros and 1)
Femto = 10^{-15} (Decimal point, followed by 14 zeros and 1)
Atto = 10^{-18} (Decimal point, followed by 17 zeros and 1)

Thus a kilometre is 1000 metres and a megametre is 1,000,000 metres while a millimetre is 0.001 metre and a micrometre is 0.000,001 metre.

Rules. Very elaborate rules have been formulated with regard to notation, type to be used, prefix symbols and the exponent to be prefixed to a symbol. Symbols are not to be followed by full stop and do not change in the plural.

Units outside the S. I. In 1969 the International Committee on Weights and Measures (CIPM), an auxiliary of the General Conference, recognised the use of some units which were strictly not part of the SI but which were in widespread use. Some of the commoner units and their SI equivalents are given below.

Table 53

Length		
1 angstrom	0.1	nanometre (nm)
1 chain	20.12	metre (m)
1 engineer's chain	30.48	do
1 fathom	1.829	do
1 foot	0.304 8‡	do
1 furlong	0.201 2‡	kilometre (km)
1 inch	25.4	nanometre(nm)
1 link	0.201 2‡	metre (m)
1 mile	1.609	kilometre (km)
1 nautical mile international	1.852	do
1 nautical mile telegraph	1.855	do
1 nautical mile U. K.	1.853	do
Area		
1 acre	4047	sq. metre
1 sq. foot	929.0	sq. centimetre
1 sq. mile	2.590	sq kilometre
1 sq. yard	0.836 1‡	sq. metre
Volume		
1 cubic foot	28.32	cubic decimetre
1 cubic inch	16.39	do centimetre
1 fluid ounce	28.41	do do
1 gallon, imperial	4.546	cubic decimetre
1 gallon US	3.785	do do
1 pint, imperial	0.586 3‡	do do
Mass		
1 grain	64.80	milligram
1 hundred weight	50.80	kilogram
1 maund	37.32	do
1 ounce	28.35	gram
1 pound	0.453 6‡	kilogram
1 quintal	100	do
1 seer	0.933 1‡	do
1 tola	11.66	gram
1 ton	1.016	tonne
1 ton US	0.907 2‡	do
Velocity		
1 foot per minute	0.005 08‡	metre per second
1 foot per second	0.304 8‡	metre per second
1 inch per second	25.4	millimetre per second
1 knot	0.514 4‡	metre per second
	1.852	km per hour
1 knot UK	0.514 7‡	metre per second
	1.853	km per hour
1 mile per hour	0.447 0‡	metre per second
	1.609	km per hour
Fuel Consumption		
1 gallon per mile	2.825	litre per km
1 US gallon per mile	2.352	do
1 mile per gallon	0.354 0‡	km per litre
1 mile per US gallon	0.425 1‡	km per litre

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‡ Among the rules of notation for S. I. one rule says that where a numerical value contains more than three digits, it is advisable to separate the digits into groups of three moving to the left or right of the decimal point. The separation is to be indicated by omitting a space and not by a comma as is usually done. The omission of space in item number 5 in the above table (0.304 8 instead of 0.304,8) and other similar omissions are to be treated as commas and read accordingly.

22

Jumping Genes

Jumping or transposans are called by various names—transposable elements, translocatable elements, movable or mobile sequences, and insertion elements. These are discrete DNA sequences capable of inserting themselves at many different sites on a chromosome (see **Genes**). *These are, in fact, nomadic inhabitants of the sub-cellular world who move over to new premises without leaving their old tenements. Actually what happens is that they plant an extra copy at a new site while returning the original copy to the initial site.*

Transposans are normal constituents of bacterial chromosomes, plasmids and bacteriophages. They are genetically and physically well defined DNA sequences which do not change in character as they move from one place to another. This mobility enables them to effect rearrangements of chromosomal segments and modify genetic activity. Their activities may therefore affect heredity, immunity and other genetic characteristics. But since they are viable to genetic engineering they may be made to yield beneficial results.

23

International Units to be Revised?

The accepted definitions of length, weight etc. are likely to be revised when the General Conference on Weights and Measures is scheduled to meet in Paris in October 1983. Not that any drastic change is on the way. What are being revised are the concepts underlying the present definitions.

Let us begin with the speed of light. As at present accepted, it is 299,792.5 km per second or 299,792,500 metres. This will change to 299,792,458 metres per second. The length of the metre will therefore be an appropriate fraction of the total distance covered by light in vacuum in one second, that is to say, one-299,792,458th second.

The new standard is chosen not to alter the length of the metre to any noticeable degree but to express it with greater precision. It would be 100 times more precise than the current distance adopted in 1960, which is based on the wavelength of orange-red light emitted by the gas krypton 86. On that scale, one metre is equal to 1,650,763.75 wavelengths of krypton light.

Applying the new standard might typically involve determining the exact wavelength of a highly stable laser. The frequency of such a laser can currently be measured—essentially by a timing process—with much greater accuracy than its wavelength. But the wavelength can be derived from the frequency by dividing the frequency into the speed of light. Once an exact and specific figure for the speed of light has been chosen, as in the proposed definition of the metre, this conversion can be performed without ambiguity.

Frequencies can already be defined with great accuracy because of the extreme precision of the internationally agreed standard for the second, which is based on oscillations of cesium 133 atoms. This definition is 10,000 times more precise than the current krypton-based standard of length.

But not as accurate as we would wish it to be. The atomic second is defined as the time taken by the cesium electron to complete 9,192,631,770 spins. This is not as accurate as it looks because the cesium atom may sometimes take more spins and sometimes less than the defined norm.

While the duration of the second, as determined by cesium oscillations, will figure in determining the new distance scale, it also controls the rate at which clocks should run throughout the world. Two basic kinds of time are currently being maintained: International Atomic Time and Universal Coordinated Time (See **Time Systems***).*

Nevertheless, the new definition of the metre is much more precise than the original one. When the Metric System was first devised (after the French Revolution) the length of the metre was placed at one-ten-millionth of the distance from the North Pole to the Equator. This calculation was later found to be erroneous and was revised as the distance indicated on a bar of platinum-iridium kept in a vault at Sevres, France. The new definition will not call for any correction in future because the speed of light is constant and unchanging.

The gram was at first defined as the weight of one cubic centimetre of water. This was found to be wrong too. At zero degree centigrade a cubic centimetre of water weighs only 0.99987 gram. Today the International Kilogram, also kept at Sevres, is the only standard based upon a physical object.

The fever of revision has infected the accepted temperature scale too—the Celsius or Centigrade scale. It is pointed out that there has been an initial error in calculating the temperature of Absolute Zero (see **Cryogenics***). Although 100 degree centigrade is now uniformly taken as the boiling point of water, the actual boiling point is 99.97 degrees only.*

PART II

HISTORY
&
CULTURE

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61. PRE-HISTORY

The Twilight Civilization. The beginnings of human civilization may be traced to our prehistoric anthropoid ancestors. The Australopithecus or Southern ape and similar other species of anthropoids built up the first civilization that we know of. The culture that these species evolved through thousands of years is called Twilight Civilization because it represents the dim beginnings of human culture. This civilization is also known as Pebble Culture because the tools that they used were mostly pebbles flaked at one end to form cutting edges.

Palaeolithic Civilization. The advent of *Homo erectus*† marks the opening of Palaeolithic Civilization, or Old Stone Age, (between 500,000 and 100,000 years ago). Java man, Peking man and other species who represented the earliest palaeolithic culture, made tools of stone and bone to hunt animals and knew the art of cooking and the use of handaxes.

Between 100,000 and 50,000 years ago a superior culture was evolved. *Neanderthal man, Rhodesian man* (discovered in 1921 in Broken Hill, Rhodesia) *Saldanah man* (discovered near Saldanah Bay, Cape Province, S. Africa in 1951) and *Solo man* of Java are among the pioneers of this civilization. They made caves their habitation and buried their dead in caves. Though derided as "cave men" by the moderns, they acquired great skill in hunting and cooking and were passionate lovers of natural beauty.

Modern Man. Some 30,000 years ago, during the last phase of the Pleistocene age (Ice age) the ancestors of modern man emerged. These people made significant advances. Their implements were more complicated, including knife-blades, engraving tools of different types and beautifully carved barbed harpoons. They were the creators of several different cultures, like the Aurignacian, Solutrean and Magdaleneian. Their interests extended beyond the elementary needs of food and shelter to painting and sculpture. The paintings on the walls of the cave of Lascaux (France) are outstanding examples of their artistic skill. They beautified themselves with necklaces and other ornaments and practised magic rites and ceremonies.

As the Pleistocene age drew to a close, the Palaeolithic civilization died out and was replaced by the Mesolithic civilization.

Mesolithic Age. The Mesolithic Age or the Middle Stone Age (10,000-8,000 BC) came after the Palaeolithic period. The Mesolithic people had to contend with a world, which was altogether different, geographically and biologically, from the world of their Palaeolithic ancestors. In the cold north (Europe), most of the animals on which Palaeolithic hunters lived had either migrated or become extinct. This compelled the Mesolithic people of the north to take to fishing to supplement their diet. In the warm south (Middle East) the Mesolithic people gathered wild wheat and barley, domesticated wild animals like dogs and took to breeding goats and sheep. It was these people who laid the foundations which were to revolutionise the Neolithic man's way of life—agriculture and stock breeding.

Neolithic Age or the New Stone Age (6,000-4,000 BC) is so named because man still relied mainly on stone-made weapons and tools, though the weapons and tools were much more developed and highly sophisticated. The Neolithic people inherited a comparatively advanced culture—the cumulative heritage of the Palaeolithic and Mesolithic civilizations. They used ingenious tools and weapons and were masters of the art of domestication of animals. Nevertheless, they remained essentially nomadic, wandering from place to place in search of food and pasture.

The basic discoveries of the Neolithic age are the domestication of animals, the cultivation of plants and the development of industries of pottery and weaving. The first animals to be domesticated were sheep, goats, cattle and pigs. In Europe, it seems that the dog was the first animal to cast in his lot with man. The ass was probably the first beast of burden. The horse was about the last to be tamed.

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† See *Evolution* S. 38

The discovery of agriculture meant that man ceased to be a wandering food gatherer. He became a food producer, tied down to land. Agriculture made it necessary to have new implements—the hoe, the plough and the scythe. Above all, it involved a settled life which meant permanent dwelling houses. The first houses were probably of reeds and skins. Then came wood and sun-baked bricks and stones. Pottery, a very early discovery, was revolutionised by the invention of the potter's wheel. Basketry and textiles developed more or less simultaneously. Textiles underwent speedy technological changes leading to the invention of the loom.

The industrial symbol of the Neolithic age is the polished stone axe, which could be used for cutting trees and killing animals and for fighting against human enemies as well. The neolithic period witnessed the making of highly sophisticated implements—polished stone axes with handles, knives, daggers, arrow heads, battle axes, reaping knives, bone and ivory needles, pins, combs etc. This age merged slowly and imperceptibly into the Chalcolithic age.

Chalcolithic Age or the Copper Stone Age (4,000-3,000 BC) is so called because during this age copper was discovered and put to use along with stone artifacts. This was also the age when the first great civilizations took shape. During this period, permanent settlements were established in the valleys of the Indus, the Euphrates and Tigris and the Nile.

Copper was the first metal that man discovered. Till the ancient Indus site of Mehrgarh in Pakistan was investigated we had no idea when or where copper was first discovered. It now seems that this metal was first discovered by the Indus people as far back as 6000 BC. Around 5000 BC copper had become a familiar metal in the Indus Valley. By 4000 BC copper was in common use not only in the Indus Valley but also in Sumeria and Egypt.

The discovery of copper led to the discovery of other metals like tin, lead, antimony and zinc. For, copper ore was usually found mixed with them. This promoted the making of alloys like bronze. When bronze was discovered it rapidly displaced copper, for it was stronger and could be cast into any shape or size.

Transport. Copper not being available everywhere, it became necessary to transport it over long distances. Means of transport had therefore to be devised. The ox and the pack ass were too slow and too clumsy for long distance transport. The wheeled cart and the sailing ship therefore came into vogue. It was only a matter of time before the horse-drawn chariot appeared. The stage was set for the emergence of the great civilizations of the Indus Valley, Sumeria, Egypt, Crete, Mycenae, Anatolia, Iran and China.

62. FIRST GREAT CIVILIZATIONS

City Civilization. Civic society or organised socio-political civilization first took shape within a narrow geographical compass that covered Egypt in the west, Indus Valley in the east, Anatolia (Asia Minor) in the north and Sumeria (Iraq & Iran) in the south. From this centre, civilization radiated outwards, reaching the Mediterranean sea board and islands in the west, and China in the east, around 2000 B.C.

The first cities were very small affairs centred around temples. The high priest of the temple was also the chief of the city. Very soon some temples became more prominent than others and the high priests of these temples became the first among city chiefs, or in other words, kings. Being extremely limited in territorial area, these embryonic states were little more than city states. Among the earliest of such states were those of the Indus Valley, Sumer and Egypt.

Indus Civilization. The Indus Civilization is the last of the great civilizations to be discovered. Though a late-comer to history books, the Indus civilization is the oldest of the first great civilizations known. Recent researches at Mehrgarh and other sites in the Indus Valley indicate that the Indus Civilization had its beginnings between 7000 and 6000 BC. Carbon-14 analysis has shown that the later structures at Mehrgarh belong to the 6th millennium BC. Earlier structures must therefore belong to a period prior to BC 6000.

It is not known who the builders of the Indus civilization were. In all probability, they were a Mediterranean race, allied to the Dravidians of India. Nor do we know very much of this civilization as the Indus seals still remain undeciphered (see Box). But the artifacts that have been found and the structures that have been unearthed indicate a level of civilization no whit behind the fabled civilizations of Sumeria and Egypt. A strange thing about this civilization is that it disappeared suddenly. What caused this sudden disappearance is still a

Box 24

The Indus Script

Two interpretations regarding the Indus script are reproduced below. They show the great divergence of views among scholars in this regard. Both were reported in 1980.

I *Soviet experts have cracked the Indus Valley script. They claim that the script resembles a Dravidian language, akin to Tamil, Malayalam or Kannada.*

Describing it as a fundamental discovery, the experts say that the script of the civilsation, which existed around 2500 B.C., is completely indigenous and original and that it was not brought from outside.

The experts say that the script has no connection with the Sumerian civilisation of West Asia or with the Egyptian Hieroglyphics.

The script, however, has been found on 800 seals in West Asia—a good evidence of a flourishing trade between these two civilisations.

The work of deciphering the script has been disclosed in a recent report in Izvestia, and quoted by a British newspaper. The discovery is attributed to Prof. Knorozov and his team of the Soviet Insititute of Ethnography.

Using computers, the team has acquired the capacity to read the existing texts, except some portions.

Another interesting finding is that the Indus Valley had a wonderful system of recording cycles of time taking into account the movements of the sun, the moon and Jupiter. The people of the valley knew even in the third millenium B.C., how to calculate the time taken by Jupiter to go round the sun.

—UNI, New Delhi, April 30

II *From his meticulous analysis of the Indus script and language Dr. S.R. Rao, eminent archaeologist, asserted here that it would be illogical to maintain that the Indus civilisation was destroyed by invading Aryans.*

In fact, delivering the anniversary address at the famous Bhandarkar Oriental Research Institute here, Mr. Rao described the Indus script as of Indo-European class and not of Dravidian origin as popularly believed so far. He emphasised that it was the Indus people who laid the foundation of the Vedic society.

After reading nearly 1800 seals of the Harappan culture, Mr. Rao has come to the conclusion that the Harappans not only spoke an Indo-European language but also observed religious rites which were later adopted by the Aryans.

He said the Indus language was an earlier form of the language of the Rigveda. Harappan seals, which speak of rulers and holy men, also appeared in the Rigveda and Vedic literature later.

Mr. Rao was confident that it was not the so-called Aryan invaders who destroyed the Indus civilisation as believed earlier, but perhaps the floods of the Indus river. He was also assertive that it had no link with the Dravidian languages as was earlier believed by scholars, including those in the USSR, who had conducted a computerised study of the Indus script and language.

—Express News Service, PUNE, Sept. 17

mystery (see Part III, India).

Sumeria. *Sumeria* was in the lower valley of the Euphrates and Tigris, in the southern half of Mesopotamia. We do not know who the Sumerians were. They were a broad-headed race, thickset and short in stature, with fleshy faces and big noses prolonging the line of the forehead without any intervening depression. Their eyes were widely set apart and slanting. They have been compared by some to the Turanians of today and by others to the Dravidians of India.

Sumeria had a hectic history. The original Sumerians were overwhelmed by a number of foreign conquerors, through successive centuries—the Akkadians, Babylonians, Assyrians, Chaldeans etc. But all through these conquests and turmoil, the old Sumerian civilization remained intact, being supplemented and reinforced by the conquering races.

Egypt. The racial origin of the Egyptians is also a matter of dispute. Some regard them as a conquering Asian race acquainted with metallurgy and armed with superior weapons, who easily triumphed over the tribes inhabiting the Nile Valley in neolithic times. The history of Egypt, unlike that of Sumeria, was more or less smooth. Except for the invasion of the Asian tribe Hyksos in 1790 B.C. and their occupation of Egypt till 1573 B.C., Egypt was ruled by a succession of indigenous dynasties, under whom the old Egyptian civilization grew up to its full dimensions.

Expansion of Civilization. On the whole, the Indus, Sumerian and Egyptian civilizations remain the supreme human achievements of the 4th millennium B.C. Once started, civilization continued to expand. Around 2000 B.C. the Phoenicians settled on the Syrian coast and laid the foundation of a maritime empire in the Mediterranean. Hittites established a kingdom in Asia Minor which later expanded eastwards and southwards. At Mycenae (Greek mainland) and Crete and adjoining islands, other tribes, about whom also we know very little, built cities that rivalled those of Sumeria and Egypt in splendour.

63. OUTLINE OF HISTORY

The Great Civilizations BC 6000 to 1000

B.C.

6000 Neolithic settlements at Mehrgarh, Baluchistan in the *Indus Valley;* Sun-dried brick houses; Domestication of cattle, water buffalo, sheep and goats; Cultivation of wheat and barley; Copper known.

5000 Development of farming in the Indus Valley—several varieties of wheat and barley/fruit trees; jujubu and date/cultivation of cotton; pottery and beads; Neolithic settlements in *Sumeria;* domestication of animals; Beginnings of farming; Neolithic settlements in *Egypt.*

4000 Invention of potter's wheel and bow drill in *Indus Valley;* kiln-fired pottery; red painted wares; beads of local stones and imported turquoise—copper melting (see Part III India). Susa founded in *Sumeria;* White painted pottery in *Egypt* and development of farming.

3500 Growth of pottery in *Indus Valley:* several varieties; egg shell thin goblets; vitrified decorated wares; beads of lapis lazuli, turquiose and carnelian; *Sumeria* develops cuneiform (wedge-shaped) writing; Sumerian temples at Erudu, Ur and Urak; Potter's wheel in use in Sumeria.

3000 Copper alloys in *Indus Valley;* bronze in use; cultivation of wine grape; First dynasty at Ur in *Sumeria;* Wheeled vehicles in use; linen produced; King Menes the Fighter unites Upper and Lower *Egypt; Phoenicians* settle on the Syrian coast with centres at Tyre and Sidon; Early *Minoan civilization* in Crete.

2980 Memphis made the capital of *Egypt;* Pharaoh god-king.

2870 Beginnings of Trojan culture in Asia Minor.

2850 Traditional beginnings of civilized life in China.

2650 The first pyramid (stepped pyramid) built in Egypt.

2500 Sixth dynasty in Egypt; Collapse of the Old Kingdom; Dominance of the Ur dynasty over all Sumeria; Sumerian numerical system based on 6 and 12; Lunar calendar (360 degrees in a circle, 60 minutes in an hour, 60-second 'minutes' in a minute etc).

Egypt introduces calendar of 365 days without adjustments; Egyptians discover use of papyrus.

Equinoxes and solstices determined in China; Beginnings of astronomical observations in Sumeria, India Egypt and China.

Harappan civilization in Indus Valley (see Part III India).

2370 Sargon King of the Akkadians (a Semitic tribe) conquers Sumeria and Elam and makes Agad his capital.

2200 Traditional beginnings of the Hsia dynasty in China.

2100 Abraham leaves Ur in Chaldea.

2000 Kingdom of Elam attacks Akkadia, destroys the capital Agad and annexes the kingdom of Ur.

Hittites, an Indo-European tribe, establish a kingdom in Asia Minor (Anatolia).

Middle Minoan period in Crete.

Mycenae in Greece becomes a centre of civilization.

Aryan settlements in India; Vedic civilization takes shape; The composition of the Rig Veda.

1995 Amenemht founds the 12th dynasty in Egypt.

1990 Babylonians conquer the whole of Mesopotamia, including Assyria (northern Mesopotamia) and Elam (eastern Iran).

1800 Hammurabi, the Babylonian Emperor, proclaims a code of laws.

1790 Hyksos, an Asian tribe, dispossesses the 13th dynasty and occupies Egypt.

1760 Shang dynasty begins in China.

1595 Hittites overthrow Babylon.

1580 Cretan civilization at its height. Jews enslaved by Egypt.

1573 Hyksos, the shepherd kings, driven out of Egypt.

1500 Flowering of Mycenaean civilization in Greece.

1480 Moses leads Jews out of Egypt.

1400 Mycenaeans destroy Knossus palace at Crete. Decay of Cretan civilization.

1380 Amenhotep (Amenophis IV) revolutionises Egyptian religion and proclaims a new religion.

1362 Rebellion in Egypt; Egypt loses her outer possessions.

1345 19th dynasty in Egypt; Egypt recovers her former power.

1250 Assyrians conquer Babylon.

1200 Philistines (Phoenicians) from north Mediterranean occupy Palestine.

Etruscans, an Asian people, settle in Italy.

Homeric siege of Troy by Greeks (?). Downfall of the Hittite Kingdom.

1027 Chou dynasty begins in China.

1013 Rise of the Israelites in Palestine. David (1013—973) establishes Israelite hegemony.

1000 Egypt ceases to be a power.

Epic civilization in India—composition of the great epics, Ramayana and Mahabharata.

Phoenicians develop alphabetical writing.

The Old Order Changeth (1000 B.C.—A.D. 1)

850 Phoenicians found the city of Carthage on the northern coast of Africa.

753 Traditional foundation of the city of Rome.

745 Assyrian Empire at its height.

621 Draco publishes Athenian laws[†]

612 Nineveh, the capital of the Assyrian Empire, destroyed by a combination of Babylonians, Scythians and Medes.

610 Ionian (Sanskrit *Yavana*, Persian and Arabic *Yunani*) city states on the west coast of Asia Minor.

604 A new empire in Mesopotamia with Babylon as capital.

594 Solon reforms Athenian constitution.

586 Babylonians capture Jerusalem.

[†] A stiff code of conduct with severe punishments for minor breaches—hence the term *draconian*.

560 Croesus, reputed to be the richest king of his times, rules Lydia. Lydians issue the earliest known systematic currency.

538 Cyrus founds the Persian Empire and captures Babylon.

509 Traditional foundation of the Roman Republic.

490 Battle of Marathon; Athenians defeat Persians.

483 Death of Buddha in India.

480 Battle of Thermopylae—Spartans under Leonidas wiped out by Persians; Battle of Salamis (naval battle)—Athenians under Themistocles rout the Persians.

479 Battle of Plataea and Mycale-Greek victories over Persia by land and sea respectively; Athenian supremacy in Greece begins; Final end of Persian threat; Death of Confucius in China.

461 Pericles comes to power in Athens.

431 Outbreak of Peloponnesian War between Athens and Sparta.

425 Death of Herodotus.

404 Athenians surrender to Sparta; Beginning of Spartan supremacy in Greece.

399 Execution of Socrates.

371 Battle of Leuctra—Thebans defeat Spartans and become the leaders of Greece; Theban hegemony.

347 Death of Plato.

338 Battle of Chaeronea; Philip II of Macedon defeats the Greek city states and becomes supreme in Greece.

336 Alexander becomes the King of Macedon.

334 Battle of Granicus; Alexander's first victory over the Persians.

333 Battle of Issus; Alexander's second victory over Darius of Persia.

332 Alexander captures Tyre and occupies Egypt.

331 Battle of Arbela (Gaugamela); Alexander finally defeats Persians.

330 Death of Darius and the end of Persian Empire.

326 Battle of Hydaspes; Alexander defeats Porus of India and conquers the Punjab.

323 Death of Alexander at Babylon; Ptolemy I founds dynasty in Egypt; Alexandria (in Egypt) becomes the intellectual centre of the world.

321 Chandragupta Maurya establishes the Mauryan dynasty in India; Death of Aristotle.

312 Seleucus I founds dynasty in Asia.

275 Battle of Beneventum; Rome finally defeats Pyrrhus and becomes undisputed master of all Italy.

274 Asoka becomes Emperor of India.

264 Beginning of the First Punic War between Rome and Carthage.

241 End of the First Punic War; Sicily becomes the first province of Rome.

221 Shih Huang Tih completes conquest of all Chinese states.

218 Beginning of the Second Punic War; Hannibal, the Carthaginian general, attacks Rome.

214 The construction of the Great Wall of China.

213 Burning of Chinese classics.

212 Romans capture Syracuse; Archimedes killed.

202 Eastern Han dynasty in China; Hannibal defeated by the Roman general, Scipio Africanus.

201 End of Second Punic War; Rome dominates western Mediterranean.

196 Rome conquers Macedon and Greek city states.

160 Judas Maccabaeus leads successful revolt against the Seleucid dynasty.

149 Outbreak of Third Punic War.

146 Romans destroy Carthage and make it a Roman province.

124 Establishment of college in China to train civil servants.

110 China under Emperor Wu Ti expands towards south east.

106 Marius and Sulla become Roman leaders.

88 Civil war between Marius and Sulla begins.

60 The formation of the First Triumvirate; Pompey, (Julius) Caesar, Crassus.

58 Caesar begins conquest of Gaul

55 Caesar's conquest of Britain.

53 Crassus, defeated by Persians, falls into disgrace in Rome.

49 Caesar crosses the Rubicon and challenges Pompey.

48 Battle of Pharsalus; Caesar defeats Pompey.

46 Caesar reforms the calendar; later known as the Julian Calendar.

44 Murder of Caesar.

43 The formation of the Second Triumvirate: Antony, Octavian (Augustus), Lepidus.

42 Battle of Philippi; Antony and Octavian defeat Brutus and his associates.

31 Battle of Actium; Octavian defeats Antony and Cleopatra and becomes the master of the Roman Empire.

27 Senate of Rome confers the title of *Augustus* on Octavian; Octavian becomes *Caesar Augustus*.

4 Birth of Jesus Christ (?).

Roman Empire and Christianity (A.D. 1—570)

A.D.

6 China institutes Civil Service Examination.

14 Augustus dies.

25 Beginning of Later Eastern Han dynasty in China.

29 Crucifixion of Christ.

63 Death of St. Paul.

64 Great Fire of Rome.

68 Death of Nero; End of Julio-Claudian line of Roman emperors.

70 Emperor Titus suppresses Jewish revolt and destroys Jerusalem.

79 Vesuvius volcano erupts and destroys the famous Roman towns of Pompeii and Herculaneum.

80 Completion of the Roman Colosseum

96 Accession of Nerva, the first of the "Five Good Emperors".

97 Chinese penetrate into Persian Gulf.

117 Death of Trajan and the accession of Hadrian; Roman Empire reaches its greatest extent.

180 Death of Marcus Aurelius, last of the "Five Good Emperors"; Beginning of the decline of the Roman Empire.

212 Emperor Caracalla gives Roman citizenship to all the free citizens of the empire.

220 Han dynasty ends in China; Period of Civil War in China begins.

230 Emperor Sujin in Japan organises a Japanese empire.

251 Goths defeat and kill the Roman emperor Decius.

284 Diocletian becomes emperor of Rome; persecution of Christians reaches its climax.

306 Constantine becomes emperor.

313 Edict of Milan gives tolerance to Christians in the Roman empire.

320 The Gupta dynasty rises in India.

325 The Council of Nicaea, first General Council of the Christian Church.

378 Battle of Adrianople; Goths defeat and kill Eastern Roman Emperor Valens.

395 Death of Emperor Theodosius the Great; Final division of the Roman Empire into Eastern and Western empires.

410 Alaric the Goth captures and destroys Rome. This is taken to be the end of the Roman Empire.

415 Visigoths begin conquest of Spain.

429 Vandals begin conquest of North Africa.

452 Attila invades Italy.

455 Rome pillaged by Vandals.

476 Romulus Augustulus, the last Western Roman emperor, deposed by Odovacar; The end of Western Roman Empire.

481 Clovis becomes the King of Franks and occupies Gaul.

493 Theodoric founds Ostrogothic Kingdom in Italy.

527 Accession of the Eastern Roman Emperor Justinian I.

529 Publication of the Civil Code by Justinian.

538 Justinian builds the famous Christian church Hagia Sophia at Constantinople.

Rise of Islam (570-1485)

570 Birth of Mohammed.

589 Reunion of China under the Ch'en dynasty.
605 Grand Canal of China constructed.
618 Tang dynasty comes into power in China.
622 Hejira or flight of Mohammed from Mecca to Medina; Beginning of the Mohammedan era.
632 Death of Mohammed; Accession of Abu Baker, the first Caliph.
636 Muslims occupy Damascus.
638 Muslims capture Jerusalem.
641 Persia conquered by Muslims.
643 Muslims occupy Alexandria.
698 Muslims invade Carthage.
711 Muslims spread into Spain.
718 The greatest Muslim attack on Constantinople fails.
732 Muslim advance in Spain halted by Charles Martel.
750 Beginning of Abbasid Caliphate (replacing Ommayyads).
786 Accession of Haroun-al-Rashid in Baghdad.
800 Coronation of Charlemagne as Holy Roman Emperor.
814 Death of Charlemagne and the division of his empire.
827 Muslims invade Sicily.
840 Muslims capture Bari and occupy Southern Italy.
843 Treaty of Verdun; Final division of the Carolingian Empire founded by Pipin, King of France, in A.D. 751; Beginning of France and Germany as separate states.
862 Rurik founds Viking state in Russia, first at Novgorod, later at Kiev.
866 Fujiwara period begins in Japan.
868 The first printed book in China.
893 Simeon founds first Bulgar Empire in Balkans.
899 Death of Alfred the Great in England.
900 Ghana in North West Africa at the height of its power.
912 Accession of Abder Rahman III; The greatest period of the Ommayyad Caliphate of Cordova (Spain).
955 Battle of Lechfeld; Magyars, finally defeated by Otto the Great, settle in Hungary.
960 Beginning of Sung dynasty in China.
966 Miezko I, King of Poland, accepts Christianity.
968 Fatimids begin their rule in Egypt.
982 Norsemen discover Greenland.
987 Hugh Capet, King of France, founds Capetian dynasty.
993 Olof Skutkonung, King of Sweden, converted to Christianity.
998 Vladimir, King of Kiev, becomes Christian.
1000 Leif Ericsson discovers North America.
1016 Canute becomes King of England.
1066 William I, Duke of Normandy, conquers England.
1069 Reforms of Wang-An-Shih in China.
1071 Battle of Manzikert; Seljuks destroy Byzantine army.
1073 Gregory VII becomes Pope.
1075 Seljuk Turks capture Jerusalem.
1086 Compilation of Domesday Book in England.
1095 Council of Clermont; Pope Urban II preaches First Crusade.
1099 First Crusade under Godfrey of Bouillon takes Jerusalem.
1135 Stephen becomes King of England; civil war with Matilda; anarchy follows.
1143 Alfonso Henriques becomes first King of Portugal.
1144 Muslims capture Christian stronghold of Edessa.
1148 Second Crusade fails to capture Damascus.
1152 Accession of Emperor Frederick Barbarossa.
1154 Henry of Anjou establishes the Plantagenet dynasty in England.
1161 Explosives used in warfare in China.
1176 Battle of Legnano; Frederick Barbarossa defeated by the Lombard League; Italian states become autonomous
1185 Kamakura period in Japan; Epoch of feudalism in Japan which lasts until 1333.
1189 Third Crusade under Frederick Barbarossa, Philip Augustus of France and Richard the Lion

Heart of England.
1191 Crusaders capture Acre.
1192 End of the Third Crusade without regaining Jerusalem.
1204 Fourth Crusade captures Constantinople.
1206 Jengiz Khan becomes King of the Mongols and overruns Central Asia.
1212 Battle of Las Navas de Tolosa; Spaniards win decisive victory over the Muslim Moors.
1215 Fourth Lateran Council; Papal authority reaches its zenith; Magna Carta in England.
1237 Mongols invade Russia.
1241 Mongol incursions into Central Europe.
1260 Kublai Khan rules in China.
1284 Edward I of England conquers Wales.
1291 The League of Uri; Beginnings of the Swiss Confederation; Acre falls to Muslims; Crusades end.
1309 Papacy moves to Avignon; Beginning of the *Babylonish Captivity*.
1314 Battle of Bannockburn; Robert Bruce of Scotland defeats the English army.
1336 Ashikaga period in Japan.
1338 Beginning of the Hundred Years' War between England and France.
1346 Battle of Crecy; English victory over the French and the Scots.
1348 Black Death reaches Europe.
1356 Battle of Poitiers; Black Prince of England defeats the French.
1360 Peace of Bretigny; Edward III of England gains territories in France.
1362 English made the official language in England.
1363 Timur (Tamerlane) begins his career of conquest in Asia.
1368 Ming dynasty in China.
1377 Pope returns to Rome; End of *Babylonish Captivity*.
1381 Peasants Revolt in England.
1398 Timur invades North India.
1415 Battle of Agincourt; Henry V of England gains a decisive victory over France.
1429 Joan of Arc leads the French army and takes Orleans.
1431 Joan of Arc burnt at stake as a witch.
1438 Albert I establishes the Hapsburg dynasty.
1453 Turks capture Constantinople and end the Byzantine or the Eastern Roman empire; End of the Hundred Years' War.
1455 First battle of St. Albans; Beginning of the Wars of the Roses in England.
1469 Marriage of Ferdinand of Aragon with Isabella of Castile and the formation of the modern kingdom of Spain.
1485 Battle of Bosworth Field; Beginning of Tudor period in England.

Colonisation (1485-1797)

1488 Bartholomew Diaz rounds Cape of Good Hope.
1492 Christopher Columbus discovers the West Indies; Spain captures the last Muslim stronghold in Europe.
1497 John Cabot discovers Newfoundland.
1498 Vasco da Gama reaches Calicut by sea.
1499 Amerigo Vespucci charts part of the South American coast.
1500 Bedro Cabral discovers Brazil.
1517 Martin Luther begins Reformation; Turks conquer Egypt.
1520 Suleiman the Magnificent becomes sultan of Turkey; Turkish power at its height.
1521 Cortes conquers Mexico; Turks capture Belgrade.
1523 Swedes expel Danish overlords and elect their own king.
1526 Battle of Panipat; Babar founds Mughul Empire in India.
1532 Francisco Pizarro conquers Peru.
1533 Ivan IV (the Terrible) becomes Czar of Russia.
1534 Act of Supremacy; Henry VIII assumes control over English Church.
1542 First Portuguese sailors reach Japan.
1545 Opening of the Council of Trent.
1556 Akbar becomes Mughul Emperor.
1557 Macao becomes permanent Portuguese port in China.
1558 Elizabeth I becomes Queen of

England.

1577 Drake begins voyage round the world returning by 1580.

1579 Union of Utrecht; Formation of the modern Dutch state.

1582 Pope Gregory XIII introduces (New style) Gregorian Calendar.

1585 Hideyoshi, dictator of Japan, unifies the country.

1588 English defeat the Spanish Armada.

1598 Edict of Nantes; French Protestants given liberty of worship; End of French Wars of Religion.

1600 English East India Company formed.

1602 Dutch East India Company founded.

1603 Union of English and Scottish Crowns; James VI of Scotland becomes James I of Britain.

1605 Gun powder Plot.

1611 Publication of the Authorised Version of the English Bible.

1613 Michael Romanov becomes Czar of Russia and establishes the Romanov dynasty.

1620 Pilgrim Fathers settle in New England.

1624 Richelieu becomes Chief Minister in France.

1628 Petition of Rights in England.

1636 Japanese forbidden to go abroad.

1641 Japanese exclude all foreigners from Japan, except small Dutch trading ships.

1642 Outbreak of the English Civil War between Royalists and Cavaliers.

1644 Ch'ing dynasty (Manchu) in China.

1649 Charles I of England executed; Cromwell becomes Protector of England.

1652 The Dutch establish Cape Colony.

1660 Restoration of monarchy in Britain; Charles II founds the Royal Society.

1661 Mazarin who succeeded Richelieu as the Chief Minister of France dies; Louis XIV takes over the government in person.

1665 Great Plague of London.

1666 Great Fire of London.

1688 Glorious Revolution in England; James II abdicates the British throne.

1689 Bill of Rights in England.

1694 Founding of the Bank of England.

1696 Peter the Great becomes Czar of Russia.

1701 War of Spanish Succession begins. Duke of Marlborough leads the English army on the continent.

1704 Marlborough wins the Battle of Blenheim.

1721 Robert Walpole becomes the first Prime Minister of England.

1739 Nadir Shah of Persia sacks Delhi; War of Jenkins' Ear begins between Spain and Britain.

1740 Frederick the Great becomes King of Prussia; Maria Theresa succeeds to the Austrian throne; Beginning of the War of Austrian Succession.

1751 Clive takes and holds Arcot in India and checks French advance; Chinese conquest of Tibet.

1756 Seven Years' War begins.

1757 Clive conquers Bengal.

1760 Battle of Wandiwash; The English defeat the French in India.

1762 Catherine II becomes Czarina in Russia.

1770 James Cook discovers New South Wales.

1773 "Boston Tea Party."

1776 American Declaration of Independence.

1787 The drafting of the American Constitution.

France (1787—1815)

1789 French Revolution begins; Storming of the Bastille (July 14); Washington becomes the first President of USA.

1792 France becomes a Republic.

1793 Louis XVI beheaded.

1794 Fall of Robespierre in France.

1795 Napoleon Bonaparte disperses Paris mob (Oct. 5).

1796 First Italian campaign of Bonaparte.

1798 Battle of the Nile.

1804 Bonaparte becomes Emperor.

1805 Battle of Trafalgar and Nelson's death; Battle of Austerlitz (Dec 2).

1807 Napoleon controls all Europe; Slave trade abolished in British Empire.

1808 Peninsular War begins.

1812 Napoleon's retreat from Moscow.

British Empire (1815—1914)

1815 Battle of Waterloo; Napoleon sent to St. Helena.

1823 President of USA announces "Monroe Doctrine."

1832 First Reform Bill in England.

1833 First British Factory Act.

1837 Queen Victoria succeeds to the British throne.

1840 Introduction of the penny postage in England.

1846 Repeal of the Corn Laws and the resignation of Peel.

1848 Louis Philippe of France abdicates; Second French Republic proclaimed; Marx and Engels publish the Communist Manifesto; Gold discovered in California.

1849 Britain annexes the Punjab.

1851 Submarine telegraph cable between Dover and Calais; Discovery of gold in Australia.

1852 Napoleon III becomes Emperor of France.

1853 Commander Perry lands in Japan.

1854 Crimean War.

1856 Livingstone completes journey across Africa.

1857 First War of Indian Independence.

1858 British Crown assumes Government of India.

1861 Abraham Lincoln becomes President of United States· American Civil War.

1862 Bismarck becomes the Chief Minister in Prussia.

1865 Assassination of Lincoln; Abolition of slavery in USA.

1867 Dominion of Canada established; Russia sells Alaska to America. Second Parliamentary Reform Bill in England.

1868 Shogunate abolished in Japan; Meiji period of rapid westernisation under imperial leadership begins.

1869 Opening of the Suez Canal.

1870 Promulgation of the Doctrine of Papal Infallibility.

1871 Franco-Prussian War; Defeat of France by Prussia; Trade Unions in Britain legalised.

1874 Disraeli succeeds Gladstone as Prime Minister.

1875 England purchases Suez Canal shares.

1878 Second War with Afghanistan ended.

1884 Third Parliamentary Reform Bill in England.

1886 Britain annexes Upper Burma; Completion of Canadian Pacific Railway; Discovery of gold in Transvaal.

1894 Japan declares war on China.

1895 Japan occupies Formosa and Korea.

1899 Boer War begins.

1900 Australian Commonwealth proclaimed.

1902 End of the Boer War.

1904 Russo-Japanese War begins.

1905 Russo-Japanese War ends by the Treaty of Portsmouth; Norway separates from Sweden.

1906 First Parliament in Russia.

1907 New Zealand becomes a Dominion.

1909 Union of South Africa formed.

1911 Chinese Revolution; Amundsen reaches South Pole (Dec. 14).

1912 China becomes a Republic under Sun yat Sen; The Titanic disaster.

World Wars 1914—1945

1914 Archduke Francis Ferdinand of Austria assassinated at Sarajevo (June 28); Serbia suspected of complicity; Austria declares war on Serbia (July 28); The beginning of the 1st world war; Germany declares war on Russia (Aug. 1), on France (Aug. 3), and invades Belgium (Aug. 3); England declares war on Germany (Aug. 4); Austria declares war on Russia (Aug. 6); Japan declares war on Germany (Aug. 23).

Battle of the Marne between France and Germany (Sept. 6-10); German advance halted.

Russia declares war on Turkey (Nov. 2); England and France follow suit (Nov. 5).

1915 Germans start air attacks and submarine blockade against

Britain; Germans sink American ship *Lusitania* (May 7).

1916 Battle of Verdun (Feb. 21—July 11). France stops German advance; Battle of Tannenburg: Russian armies humbled by Germany (Aug. 25); Battle of Jutland: Britain breaks German naval strength (May 31); Battle of Somme. France keeps her lines against Germany (July 1—Nov. 18); Lloyd George, Premier, forms war cabinet in Britain; Germans advance on the Eastern front; Vilna falls (Sept. 18).
Rasputin, the rascal Russian monk, assassinated by Prince Felix Yussupov (Dec. 30).

1917 Russian troops mutiny in Petrograd (March 10); Provisional government formed in Russia—Tsar Nicholas II abdicates (March 15); USA declares war on Germany (April 6); Bolshevik Revolution begins in Russia (Nov. 6); Armistice concluded between the Revolutionary Government in Russia and Germany (Dec. 5).

1918 Treaty of Brest-Litvosk between Germany and Bolshevik Russia (March 3).
British capture Jerusalem (Dec. 8); Tsar, Tsarina and children executed at Ekateringburg.
Revolution breaks out in Germany; Emperor William II abdicates; German Republic proclaimed (Nov. 9).

1919 Peace conference opens in Paris (Jan. 18); Benito Mussolini founds Italian Fascist Party; Jalianwalla massacre in India (April 13). Treaty of Versailles signed (June 28). (France)

1920 First meeting of the League of Nations S/F USA

1921 Formation of the Irish Free State.

1922 Mussolini marches on Rome and the Fascist Party takes over the Government of Italy.

1923 Turkish Republic proclaimed under Kemal Pasha.

1924 The first Labour Ministry in Britain under MacDonald; Greece becomes a Republic; Lenin dies (Jan. 21).

1927 Col. Lindbergh flies across Atlantic.

1928 Capt. Kingsford Smith flies across Pacific.

1929 Wall Street Crash; The beginning of the Great Depression; King Amanullah of Afghanistan abdicates.

1933 Hitler appointed Chancellor by Hindenburg; German Reichstag set on fire (Feb. 27).

1934 Austrian Chancellor, Dollfuss, murdered (July 25); Hindenburg dies and Hitler becomes dictator.

1935 Italy starts war against Ethiopia.

1936 Italians occupy Addis Ababa; Civil War breaks out in Spain; King Edward VIII of England abdicates; Duke of York succeeds King Edward as King George VI.

1938 Munich Agreement between Chamberlain (England), Daladier (France), Hitler (Germany) and Mussolini (Italy).

1939 General Franco establishes dictatorship in Spain (Feb.); Germans invade Poland; Germans and Russians partition Poland; Second World War begins (Sept.). 9

1940 Germany invades Denmark, Norway, Holland, Belgium and Luxembourg; British evacuation from Dunkrik; Germans occupy Paris; Russians occupy Lithuania, Latvia and Estonia; France surrenders to Germany (June).

1941 Germany attacks Russia (June), Japanese attack on Pearl Harbour (Nov. 7); Japanese occupy Malaya, Phillippines and Sarawak.

1942 Japanese navy defeated by US fleets off Midway Island (June); Battle of El Alamein (October 23); The Allies rout German forces; The Germans retreat.

1943 Axis Powers—Germany, Italy and Japan—in retreat all over the war zones; Mussolini resigns; Italian Fascist Party is dissolved; Churchill, Roosevelt and Stalin, leaders of the victorious Allies, meet at Teheran.

1944 Allies enter Rome; Allies liberate France, Belgium, Holland and Bulgaria.

64. THE UN & AFTER

International Events

1945 Americans invade Okinawa: Japanese Cabinet resigns; President Roosevelt dies (April 12); Mussolini and his mistress shot dead by Italian partisans (April 28); Hitler and his mistress Eva Braun commit suicide (April 30); German forces surrender to Allied armies (May 8); United Nations Charter signed at San Francisco (June 26); Labour Party wins British elections (July 26); Atomic bomb dropped on Hiroshima (Aug. 6); Second atom bomb dropped on Nagasaki (Aug. 9); Japan surrenders to USA; The end of the Second World War; Trial of major war criminals opens at Nuremberg (Nov. 20).

1946 The first regular session of the UN Assembly held in London (Jan.); Trygve Lie elected the first Secretary General; Formal winding up of the League of Nations; Meeting of the UN General Assembly in New York (Oct. 23); Nuremberg sentences on Nazis executed; Goering commits suicide.

1947 Indonesia becomes free; India and Pakistan assume Dominion status (Aug. 15); The partition of Palestine approved by the UN; King Michael of Romania abdicates; Romania becomes a Republic.

1948 Burma becomes a Republic; Gandhiji assassinated (Jan. 30); Ceylon becomes independent; C. Rajagopalachari succeeds Mountbatten as the Governor General of India; Jews proclaim the new State of Israel in Palestine.

1949 General Mao-Tse-Tung proclaims the People's Republic of China; Chinese Nationalist Government sets up headquarters in Formosa; United States of Indonesia comes into being.

1950 The proclamation of the Republic of India (Jan. 26); The Korean War begins; George Bernard Shaw dies aged 94 (Nov. 2).

1951 Libya becomes independent.

1952 King George VI of Great Britain dies and is succeeded by his daughter Elizabeth II; Olympic Games open at Helsinki (July 1).

1953 Stalin dies aged 74 (March 6); Dag Hammarskjold elected Secretary General of the UN; Hillary and Tensing conquer Everest (March 29); Korean armistice signed.

1954 Formation of the Federation of Rhodesia and Nyasaland; French settlements in India pass under Indian control.

1955 Marshal Bulganin succeeds Malenkov as Chairman of the Soviet Council of Ministers; Churchill resigns Prime Ministership and is succeeded by Anthony Eden; Afro-Asian Conference at Bandung; Albert Einstein dies (April 18).

1956 Sudan becomes an independent Republic; Pakistan proclaims itself an Islamic Republic; France leaves Indo-China; Col. Nasser becomes President of Egypt; Nationalisation of Suez Canal by President Nasser; Revolt in Hungary against communist regime; Russia sends troops to Hungary to quell the revolt.

1957 Saar added to the German Federal Republic; Polish Communist Party under Gomulka comes to power in Poland; Ghana becomes independent; Tunisia becomes a republic; First earth satellite (Sputnik I) launched by Russia.

1958 The first American Earth satellite Explorer I launched; Iraq becomes a republic; French Guinea becomes an independent republic.

1959 Batista Government in Cuba overthrown by Fidel Castro; Alaska becomes the 49th State of USA; Inauguration of the Fifth French Republic under De Gaulle; the Chinese occupy Tibet; Dalai Lama flees to India; Bandaranaike, Prime Minister of Ceylon, assassinated; Archbishop Makarios elected first President of Cyprus.

1960 Republic of Cameroon (formerly

French Cameroon) becomes an independent State; Republic of Togo (formerly Togoland) comes into existence; Madagascar becomes an independent State; Belgian Congo becomes a republic; Ghana proclaimed a republic; Somali Republic comes into existence, merging the British Somaliland and Italian Somaliland; Congo (Brazzaville), Chad and Central African Republic become independent; Cyprus becomes an independent republic; Olympic Games at Rome (Aug.); Nigeria becomes an independent republic in the Commonwealth.

1961 Rwanda and Urundi in Africa become republics; Sierra Leone becomes independent; South Africa becomes a republic and withdraws from the Commonwealth; North Cameroon becomes part of Nigeria; Conference of non-aligned nations at Belgrade; Syria secedes from the United Arab Republic; S. Cameroon gains independence; Tanganyika becomes an independent sovereign state within the Commonwealth; India annexes the Portuguese enclaves Goa, Diu and Daman.

1962 General Ne Win seizes power in Burma; China begins attack on India's northern frontier (Sept. 19); U Thant elected Secretary General of United Nations (Nov. 30).

1963 China and Pakistan sign frontier treaty; Egypt, Syria and Iraq form Arab Federation; Malaya, Singapore and South Borneo form Malaysian Federation; The assassination of President John F. Kennedy in Dallas, Texas (Nov. 22); Zanzibar becomes independent.

1964 Agreement signed between Tanganyika and Zanzibar forming a new State, Tanzania; Jawaharlal Nehru, Prime Minister of India, dies (May 27; Malta becomes independent; Russian Premier Krushchev ousted; Alexei Kosygin becomes Premier and Leonid Brezhnev, Secretary of the Communist Party; Olympiad at Tokyo (Oct.).

1965 Field Marshal Ayub Khan is elected President of Pakistan; Indonesia withdraws from UN (Jan. 5); Sir Winston Churchill is dead (Jan. 24); Dr. Albert Schweitzer is dead (Aug. 15); Rhodesia seizes independence, Mobutu takes over in a bloodless coup in the Congo; Soviet President Anastas Mikoyan steps down; Nikolai Podgorny becomes the new Soviet President.

1966 Army takes over the Government of Ghana, deposes President Nkrumah; Sukarno (Indonesia) hands over power to Army Chief Suharto (Mar. 12); Guyana (Guiana) becomes independent; South Africa's Prime Minister Dr. Verwoerd assassinated.

1967 India signs International Space Treaty in Moscow; Gen. Suharto becomes President of Indonesia; Konrad Adenauer, former West German Chancellor, dies; Nasser blocks Gulf of Aquaba, Israel's vital sea outlet; UAR Forces fire on Israeli patrol near Gaza; The province of Eastern Nigeria secedes from the Federation and forms the independent Republic of Biafra; Jordanian troops fire at Israeli units in Jerusalem; Israel strikes a pre-dawn blow on UAR, Syria and Jordan, crippling all efforts at defence; Israel captures Gaza, Sinai area and also Jerusalem and claims complete victory over Arabs; Fighting ends in Suez Canal area with acceptance of cease-fire; Russia celebrates the 50th anniversary of the Bolshevik Revolution.

1968 South Pacific Island of Nauru becomes an independent republic; Indo-Pakistan war in the Rann of Kutch; ceasefire (June 30); Mauritius becomes an independent state; Martin Luther King assassinated (Mar. 5); The Soviet Union and Warsaw Pact countries' forces invade Czechoslovakia; Swaziland becomes independent; the 19th Olympic Games open in Mexico (Oct. 9); Equatorial Guinea becomes independent.

1969 Mrs. Golda Meir is sworn in as the Prime Minister of Israel; President Ayub Khan steps down and hands over power to the Army Commander Gen. Agha

Mohammed Yahya Khan; Dwight D. Eisenhower (78), former US President and Supreme Commander in World war II, dies (Mar. 28); American astronauts Neil Armstrong and Edwin Aldrin set foot on the Moon (July 21); Al Aqsa in Jerusalem, the third holiest shrine of Islam, is partially destroyed by fire; President Dr. Ho Chi Minh (79), the Father of North Vietnam, passes away (Sept. 4).

1970 The 30-month fighting for a separate Biafra collapses after the surrender of secessionist leaders; Bertrand Russell (97) passes away (Feb. 3); Former Portuguese dictator Antonio Salazar (81) passes away (July 27); President Gamal Abdel Nasser (52) dies of heart attack (Sept. 29); Charles de Gaulle (79), former President of France, dies (Nov. 10); More than a million people killed when a tidal wave smashes into offshore islands of East Pakistan; Defence Minister Hafez Assad seizes power in Syria (Nov. 14); Lunokhod 1, automatic vehicle, successfully landed on Moon by the Russians (Nov. 17); Awami League headed by Sheik Mujibur Rahman gets absolute majority in Pakistan's first general election.

1971 Inauguration of the Aswan Dam in Egypt (Jan. 15); Gen. Idi Amin ousts President Milton Obote in Uganda and takes over power (25); Apollo 14 takes 3 American astronauts Alan Shepard, Stuart Roosa and Edgar Mitchell to the moon; Shepard and Mitchell land on the moon (Feb. 2); Yahya Khan opens a reign of terror in East Pakistan (Bangladesh); Mujibur Rahman declares Bangladesh independent (Mar. 26); Mujibur Rahman forms an independent government for Bangladesh with himself as President (April 11); Bangladesh leaders, including Mujibur Rahman, arrested by the Pakistan army; Russia sends up Salyut I; Soyuz X links with Salyut in space (April 19); Soyuz XI sent up to dock with Salyut I; Cosmonauts found dead on return (June 6); Apollo 15 launched (Aug. 8); Nikita Krushchev dies (Sep. 11); Red China admitted to the UN; Taiwan expelled (Oct. 25); Union of Arab Emirates formed (Dec. 2); Pakistan attacks India from the west (3); India recognises Bangladesh; Pakistan army in Bangladesh surrenders to the joint Indian and Bangladesh army commander (16); Indo-Pakistan war ends (17); Yahya Khan resigns Pakistan Presidentship, Bhutto becomes President and Martial Law Administrator (20); Dr. Kurt Waldheim appointed UN Secretary General.

1972 Bhutto releases Mujibur Rahman from prison (Jan. 8); Pakistan leaves Commonwealth; Martial Law administration scrapped in Pakistan; An interim constitution is proclaimed (April 21); President Nixon visits Moscow (May 22); Fourth Conference of non-aligned nations meets in Georgetown, Guyana (Aug. 8); Twentieth Olympics open at Munich (26); Bloodbath in Olympic village; Arab guerillas kidnap and kill Israeli sportsmen; Nixon elected President for a second term (Nov. 8).

1973 Britain joins E.C.M. (Jan. 1); First election in independent Bangladesh; Awami League led by Mujibur Rahman wins by a thumping majority (Mar. 2); Pablo Piccasso dies (April 8); Bahamas becomes independent (July 10); Pakistan adopts new constitution (13); Afghanistan ends monarchy and becomes a republic (18); W. Germany, East Germany and Bahamas become U. N. members (19); War breaks out in West Asia between Israel and Egypt and Syria (Oct. 6); Ceasefire in West Asia (22); David Ben Gurion, first Prime Minister of Israel, dies (Dec. 1).

1974 Mohommadulla elected President of Bangladesh (Jan. 24); Libya nationalises American oil companies (Feb. 11); Pakistan recognises Bangladesh (22); Emperor Haile Selassie deposed; Army takes over the government (27); Jigme Singye Wangchuk crowned King of Bhutan (June 2); Cyprus army overthrows President Makarios (July 15); Greece and Turkey accept U.N. Security Council call for ceasefire in Cyprus (22); Nixon resigns presidency; Gerald Ford takes over as the 38th President of USA (Aug. 9); Nelson Rockefeller named US Vice-President (20); President Ford pardons Nixon for his offences (Sept. 8); UN admits Bangladesh, Guinea-Bissau and Grenada as members; Labour wins British elections with a narrow majority (Oct. 11); World Food Conference at Rome ends (16); U Thant, former UN Secretary General, dies in Burma (25); Malta becomes a republic (Dec. 15).

975 Jewish terrorists raid Indian Mission at the U.N.; India's support to PLO resented (Jan. 14); India & Pakistan sign trade pact in Islamabad (23); Mujib assumes full powers as President; One-party rule in Bangladesh (25); US-Soviet arms limitation talks open at Geneva (Feb. 1); Mrs. Margaret Thatcher elected first woman leader of the British Conservative Party (11); P. G. Wodehouse dead; Julian Huxley dead (14); Birendra crowned King of Nepal (Mar. 6); King Faisal of Saudi Arabia assassinated (25); Taiwan's President Chiang Kaishek dead (April 5); Saigon surrenders to communists (30); Mrs. Junko Tabei (36) of Japan becomes the first woman mountaineer to scale Mt. Everest (May 17); South Africa rejects Security Council ultimatum to quit S. W. Africa (28); Mr. Eisaku Sato, former Prime Minister of Japan and Nobel Peace Laureate, dead (June 2); Suez Canal reopens after eight years (5); Mozambique becomes free after nearly 500 years' Portuguese rule (July 6); Sao Tome and Principe Islands off the west coast of Africa achieve independence from Portugal (12); Soviet 'Soyuz' and American 'Apollo' space ships link up in space (17); Pre-dawn army coup in Bangaladesh; Sheik Mujibur Rahman killed; New regime under Mr. Khondekar Mushtaq Ahmed (Aug. 15); Israel signs agreement with Egypt (Sept. 1); Prince Norodom Sihanouk returns to Cambodia (9); Papua (New Guinea) becomes free (15); Special UN session adopts plan for new world economic order (16); The Nobel Peace Prize goes to father of Soviet hydrogen bomb, Dr. Sakharov (Oct. 9); Israel signs interim agreement with Egypt; troop withdrawals from Sinai begin (10); 'Venus'-9 softlands on planet Venus while module becomes artificial satellite; Arnold Toynbee dead (22); Angola becomes free from Portuguese rule; Spanish dictator Franco dead (Nov. 20); Juan Carlos becomes King of Spain (22); Laos becomes a Republic (Dec. 3).

1976 Oil firms nationalised in Venezuela (Jan. 1); Anwar Sadat gets second term as President (2); Premier Chou En-lai of China dies (8); Paul Robeson dies (23); 3000 killed in Guatemala earthquake (Feb. 4); Harold Wilson announces resignation (16); Military chiefs take over in Argentina, arrest Mrs. Peron and dissolve Parliament (24); International Islamic Conference held in London (April 3); James Callaghan is new British Prime Minister; Hua Kuo-feng made Chinese Premier (7); UNCTAD IV opens in Nairobi (May 5); Nearly 250 die in north east Italy as earthquake strikes West Europe (7); Mrs. Gandhi and Brezhnev sign Moscow declaration to further friendship, co-operation (June 11); Vietnam is unified (24); Seychelles becomes independent (29); Airborne Israeli Commandos destroy Uganda planes, kill 100 Ugandans and free Air France Air-bus passengers from hijackers at Entebe, Uganda (July 4); Over 9000 dead in Iran earthquake of June 26 and 28 (8); Over 1000 feared dead in Bali quake (15); Exodus by 16 African nations as Montreal Olympics open reduces the games to a virtual "White affair" (17); US Probe lands on Mars (20); Soares heads first democratic Government in Portugal (23); Extensive quake damage in China (28); Non-aligned summit opens at Colombo (Aug. 16); Massive earthquake and tidal wave hit the Philippines—thousands killed (17); Second World Hindi Conference in Mauritius; Khan Abdul Ghaffar Khan is released in Pakistan (28); Mao Tse-tung dies (Sept. 9); 176 killed in plane collision over Yugoslavia (10); China conducts 19th nuclear test (26); Military seizes power in Thailand (Oct. 6); Hua Kuo-feng succeeds Mao in China (9); Mao's widow Mrs. Chiang Ching and three top radicals arrested (12); India elected to UN Security Council (23); Jimmy Carter wins US Presidential election (Nov. 3); In East Turkey, 3000 die in earthquake (24); Dr. Kurt Waldheim gets second term as UN Secretary General (Dec. 8); Sir Sewoosagur Ramgoolam forms Coalition Government in Mauritius (23); Takeo Fukuda succeeds Miki as Japanese Prime Minister (24); Seventy-two killed in Bangkok as Egyptian Boeing tears through textile mills and explodes; 43 Hajis missing after pilgrim ship sinks in Red Sea (25).

1977 Jimmy Carter sworn in President of the United States (Jan 20); Walter Mondale US Vice-President; Mohammed Daud sworn in President of the Republic of Afghanistan (Feb. 17); Bhutto's People's Party wins landside victory in Pak Polls—Rigging alleged (March 8); Big win for Leftists in poll in Laos; 60 dead in Iran earthquake (21); Pak crack-down on Opposition (25); 563 die in jet collision in Spanish airport (27); Major General Ziaur Rahman sworn in new Bangladesh President (April 21); Ludwig Erhard, former West German Chancellor dead (May 6); Bhutto announces referendum; Carter backs homeland for Palestinians; US to pull out of South Korea (14); 400 dead in night club fire in US (30); Leonid Brezhnev elected Soviet President; Dr. Wernher Von Braun, the German-born rocket expert passes away (June 16); Djibouti becomes independent (27); Coup in Pakistan; General Zia-ul-Haque takes over. Bhutto deposed and arrested (July 5); Ruling (Sirimavo's) Party routed in Sri Lanka poll—Jayawardene becomes Premier (22); Bhutto released in Pakistan (29); The Cyprus President Archbishop Makarios dies in Nicosia (Aug. 3); Ian Smith wins election in Rhodesia (Sept. 1); Bhutto arrested again in murder case (3); North Yemen President and brother assassinated (Oct. 12); Lufthansa plane hijacked; West German anti-guerilla squad kills three hijackers and frees hostages in historic action in Mogadishu on October 18 (13); Bloodless coup in Thailand (21); US withdraws from ILO (Nov. 2); South African Government assumes emergency powers (11); President Sadat of Egypt makes historic visit to Israel (19); Arab front against Egypt formed (Dec. 4); Charlie Chaplin dead (25).

1978 Jayawardene sworn in as First President of Sri Lanka (Feb. 4); Hua re-elected Chinese Prime Minister; Two Russian cosmonauts set up record with 84 days in space (Mar. 4); Bhutto appeals against death sentence (25); Military junta seizes power in Afghanistan (Apr. 27); Coup in Comoros Is. (May 13); Zia-ur-Rahman wins Bangladesh Presidential election (June 4); Argentina wins World Cup Football beating Holland, 3-1 (25); Coup in South Yemen (26); Australia's uranium-rich northern territory achieves self-government (July 1); Chief of Defence Staff, Ghana, takes over as Head of State (5); Army officers seize power in Mauritania (10); First test-tube baby born in Oldham, U.K. (25); Commonwealth Games at Edmonton, Canada, (Aug. 3); President Jomo Kenyatta of Kenya dies (22); Zia-Ul-Haque sworn in as President of Pakistan (Sept. 16); Peter William Botha elected South African Prime Minister (26); Daniel Arap Moi elected President of Kenya (Oct. 6); 900 bodies of victims of suicide by a religious sect found in Guyana (Nov. 20); Coup in Bolivia (24); The Times Newspapers close down (Dec. 1); Mrs. Golda Meir dies (8); Asian Games begin in Bangkok (9); Pioneer Venus-1 in Venus Orbit sends signals (10).

1979 International Year of the Child opens (Jan. 1); Shah leaves Iran (16); Ayatullah Khomeini returns to Iran after 14 years of exile (Feb. 1); Egypt & Israel sign accord (Mar. 25); Iran proclaimed an Islamic Republic (Apr. 1); Bhutto executed (4); Idi Amin overthrown in Uganda (11); Greenland gets home rule (May 1); Margaret Thatcher becomes the first woman Prime Minister of Britain (4); Bhaskara launched from Soviet Russia (June. 1); Salt II agreement signed by Carter and Brezhnev in Vienna (18); Skylab plunges down off the western Australian coast (July 11); Mountbatten killed in an explosion off Ireland (Aug. 27); Sixth Non-Aligned Conference opens in Havana (Sept. 3); Tarakki resigns and Hafizulla Amin takes over as Prime Minister of Afghanistan (16); Emperor Bokassa of the Central African Empire overthrown in a coup (21); Army seizes power in Bolivia (Nov. 1); Iranian students occupy US Embassy in Teheran and holds the residents as hostages (4); Ohira re-elected Prime Minister of Japan (6); Muslim extremists seize Kaaba Mosque in Mecca (21); New Zealand plane with 251 people crashes in Antarctica (28); Rhodesia peace accord signed (Dec. 21); Amin of Afghanistan killed in a coup (27).

1980 U.S. halts grain shipments to Russia in retaliation to the latter's occupation of Afghanistan (Jan. 5); Islamic Foreign Ministers, meeting in Islamabad, condemn Soviet action in Afghanistan (29); Trudeau returns to power in Canada (Feb. 19); Army seizes power in Surinam (25). Jesse Owens, American Olympic Champion, dies (Mar. 31); U.S. President Carter expels all Iranian diplomats in retaliation over the holding of U.S. Embassy personnel as hostages (Apr. 7); Mrs. Bhutto and daughter Benazir Bhutto released from house detention (8); Jean Paul-Sartre, French philosopher and writer, dies (16); Free Zimbabwe born (17); U.S. attempt to free hostages in Iran fails (22); Marshal Tito of Yugoslavia dies (May 4); China admitted to the World Bank (16); China successfully tests long-range rocket (ICBM) (18); Japanese P.M. Ohira dies; Suzuki becomes new P.M. (June 12); Coup in Bolivia (July 18); Moscow Olympics (1980) begin (19); Saudi Arabian jetliner explodes in Riyadh killing 265 persons (Aug. 20); Polish workers wrest right to strike (30); Regional meeting of Common-wealth Heads of Government (CHOGRAM 2) opens in Delhi (Sep. 4); Hua resigns Premiership of China; Zhao Ziyang takes over (6); Libya and Syria announce merger (10); Saudi Arabian military plane crashes—89 die (15); Quake in Algeria kills 20,000 (Oct. 10); Emergency proclaimed in Sri Lanka (14); Mrs. Bandaranaike stripped of civic rights (16); Kosygin resigns as Soviet Premier (23); Ronald Reagan elected U.S. President in a landslide victory over Jimmy Carter (Nov. 5); Coup in Guinea-Bissau (15); Trial of 'Gang of Four' begins in Peking (20); Eighty-five die in hotel fire in Las Vegas (22); Five thousand die in Italy Quake (24); Coup in Upper Volta (25); Kosygin, former Soviet Premier, dies (Dec. 19).

1981

January

1. International year of disabled persons begins. 2. Banking Islamised in Pakistan. 5. Government takes over control of five newspapers in Zimbabwe. 7. Libya and Chad merge. 12. Iraq puts up oil price. Iran drops demand for $24 billion from US in return for releasing hostages. 13. Tamil areas in Sri Lanka promised boost in development plans. Left wing guerillas in Salvador form Government in exile. 15. OAU condemns Chad—Libya merger US resumes military assistance to junta in El Salvador. 16. Libya rejects OAU call to pull out of Chad. Martial law imposed on September 21, 1972 in the Philippines lifted. 18. Iran

reports, it has reached agreement with the US on the terms to release the 52 American hostages. 19. Islamic foreign Ministers meeting to resolve differences over the Iraq-Iran war, disagree sharply on Soviet military intervention in Afghanistan. 20. Fifty-two American hostages fly out of Teheran after 444 days of captivity. Mr. Ronald Reagan takes charge as the 40th President of the United States. 23. Another strike wave in Poland. 24. Major earthquake in South West China kills 100. 25. China's special court sentences Mao's widow, Jiang Qing, to death for treason, but follows it up with suspension of sentence for two years of solitary confinement and hard labour. 26. Ancient flag of the Jaffna Tamil kings unfurled in Jaffna after lapse of nearly 400 years. New challenge to Polish Government as students join workers and farmers in protest against Government policies. Chinese Premier, Mr. Zhao Ziyang, leaves Beijing on first foreign trip after becoming head of Government.

February

9. Non-aligned Foreign Ministers' Conference opens in Delhi. 10. Mr. Roy Panther, amateur astronomer, discovers new comet. The comet has been named Panther's comet. Polish PM Mr. Jozef Pinkowski resigns. The ruling Communist Party's Central Committee recommends Gen. Jeruzelski as a replacement. 13. US asks Cuban diplomats to leave. Non-aligned meet ends, with compromise formulations on all contentious issues. Prince Norodom Sihanouk decides to join hands with Khmer Rouge and other Kampuchean forces fighting the Vietnamese; China hails decision. 17. Pope John Paul in the Philippines. 18. Sheikh Mujibur Rahman's daughter, Begum Hasina Sheikh, elected President of the Bangladesh Awami League. 25. Pope John Paul II in Japan (Hiroshima). President Chun Doo Hwan reelected to a seven-year term as South Korea's head of state. 26. Leading Opposition politicians arrested in Lahore. Opposition coalition meeting plans anti-Zia movement.

March

2. A Pakistan airliner on a domestic flight from Karachi to Peshawar, hijacked to Afghanistan. 5. Leftist guerillas attack US embassy in San Salvador. Mr. Reagan, US President, seeks massive increases in military spending, which includes a beefing up of the U.S. military base in Diego Garcia. 6. Hijackers holding 116 people aboard Pakistan jet at Kabul airport shoot and kill the second secretary of the Pakistan embassy in Teheran. 8. Pakistan airline hijacked to Afghanistan on March 2 leaves for unknown destination with more than 100 passengers on board after Pakistani team breaks off talks with hijackers. Begum Bhutto and her daughter Miss Benazir are arrested and sent to Karachi central prison. 9. Hijacked Pakistani plane is taken to Damascus. Gen. Zia-Ul-Haq, Pakistan's military ruler, again turns down demands for elections and announces a new expanded military-civilian Cabinet. 10. Reagan administration decides to re-arm Pakistan. 12. More than 40 million people are affected by disastrous floods and drought in two Chinese provinces, Hubei and Hebei. 14. Pakistani hijackers surrender to Syrian authorities and release more than 100 hostages in response to release of arrested men by Gen. Zia. 18. Ugandan President Mr. Milton Obote calls on all Asians expelled in 1972 by ousted dictator Idi Amin to return to their country and repossess their property. 20. Former Argentine President, Mrs. Maria Estela Peron, sentenced to eight years in prison. 24. All political parties in Pakistan are dissolved. 25. ASEAN rejects Soviet appeal for a conference between ASEAN-member countries and other States in South-East Asia to discuss Kampuchean issue.

Pakistan's Chief Justice and eight other senior judges lose their jobs when they refuse to take a new oath of office giving the President Mr. Zia-ul-Huq unfettered freedom to change the country's Constitution. 29. Gen. Roberto Viola is sworn in as Argentina's 38th President for a three-year term. 31. Reagan shot at, but survives assassin's bullet.

April

1. "Ordinary people" directed by Robert Redford wins Hollywood Oscar award for the best film. Coup attempt by General Sant Chitpatime in Thailand. 3. Gen. Prem Tinsulanonda returns to power as premier as loyalist troops recapture Bangkok from rebel soldiers led by General Sant Chitpatime. 5. As East Block leaders meet in Prague, more Warsaw Pact units rush to Poland's borders. 7. Saudi Arabia breaks off diplomatic relations with Afghanistan. 8. Blast in Indian High Commission in Uganda injures two. Philippine plebiscite votes for President Marcos unanimously. 10. Polish government calls for 60-day ban on strikes to save country from total chaos. 12. Major race riot in London. U.S. Space shuttle, Columbia, with two astronauts, blasts off from Cape Canaveral. 14. U.S. Space shuttle, Columbia, lands back on earth perfectly. Malaysian Deputy Prime Minister Dr. Mahathir Mohammed inaugurates Second World Telugu Conference. Violence again in Brixton, judge to probe into riots. 16. 1981 Pulitzer prize winning journalist, Janet Cook, refuses prize. 17. US announces intention to terminate the Tarapur agreement on nuclear supplies. 21. Pakistan Foreign Minister Mr. Agha Sahhi announces a five-year programme of security assurance offered by the U.S. to Pakistan. 24. U.S. lifts grain embargo against USSR.

May

3. U.S. decides to back Kampuchean rebel forces; French para-military police release 102 hostages from hijacked Irish airliner at Le Touquet. 4. Huge American rally in Washington to protest against "the drift towards war abroad and increased human suffering at home..." 5. Mrs. Gandhi in Geneva; IRA hunger striker Bobby Sands dies; Roman Catholic mobs attack security forces at Belfast; Poll in Kampuchea, the first since the fall of Pol Pot Government in 1979; President Heng Samrin and his colleagues returned by majority. 7. U.S. orders the closing of Libyan diplomatic mission in Washington and expulsion of all Libyan diplomats; Border clashes between China and Vietnam; 100 Vietnamese killed. 9. Mrs. Gandhi in Kuwait; Elections in Nepal. 10. Socialist Party Chief Mr. Francois Mitterrand wins the French Presidential election defeating Mr. Giscard Estaing. 12. Another IRA prisoner on hunger strike dies. 13. Pope John Paul shot at in Vatican City. 21. Third Irish national dies in jail; Mr. Pierre Mauroy named French Prime Minister. 22. Another IRA man (fourth) dies in Belfast jail. 30. Mr. Zia-Ur-Rahman, President of Bangladesh and eight aides assassinated. Emergency proclaimed. 31. Chinese Premier Mr. Zhao Ziyang leaves on his first official visit to Pakistan and Nepal.

June

4. Sri Lanka proclaims state of emergency; N. Sanjiva Reddi, President, in Lusaka, Zambia. 5. House of Commons passes Britain's controversial new Nationality Bill. 6. World's first twins conceived in a test-tube, a boy and a girl, are born to a 31-year-old woman in Melbourne's Queen Victoria hospital. 8. Foreign Minister Mr. P.V. Narasimha Rao in Islamabad. 10. Iran's President, Mr. Abolhassan Bani-Sadr, dismissed from his post as Commander-in Chief of the armed forces by Ayatullah Khomeini. 11. More than 5000 persons die in earthquake in Iran's south-eastern province of Kerman. 16. Mr. Surya Bahadur Thapa takes over as Nepal Prime Minister. 28. Sixty-nine of Iran's

political leaders, including the Chief Justice, Ayatullah Mohammed Beheshti killed in a bomb blast in Teheran; Chinese Communist Party Chairman Mr. Hua Guofeng is replaced by Mr. Hu Yaobang. 30. Teheran Evin Jail Governor shot dead.

July

3. Polish Premier Jaruzelski effects major cabinet changes. 6. Night-long riots in mainly immigrant district of Toxteth, Liverpool, N.W. England. 7. Mrs. Sandra Day O' Connor appointed the first woman judge of the U.S. Supreme Court. 13. Another IRA prisoner Martin Hurson, dies in Belfast jail after a 45-day fast. 16. Polish Communist Party Congress expels former First Secretary Edward Gierek, former PM Edward Babiuch and others. 25. Mohammed Ali Rajai elected President of Iran to succeed Bani-Sadr. 29. Paris gives asylum to Bani-Sadr; Prince Charles, heir-apparent to the British throne, weds Lady Diana; Polish Deputy Premier Jagielski sacked as food riots spread.

August

3. Bani-Sadr, deposed Iran President, orders formation of Govt.-in-Exile; Violence against Indians in Anaparai in north-east Sri Lanka. 11. Japan puts satellite in orbit. 21. Censorship imposed in Sri Lanka. 22. 110 die as Taiwan airliner blows up after take-off. 24. Indian pilgrim S. Dhanapatti hijacked to death in Sri Lanka. 30. Iran's President Mohammed Ali Rajai and Prime Minister Mohammed Banohar killed in bomb blast in the PM's office.

September

2. Md. Madhavi Kani named new Prime Minister of Iran; Belize becomes independent. 11. Ayatullah Assadollah Madani, a close aide of Ayatullah Khomeini, killed in a grenade attack in northern Iran. 22. The world's fastest train at 370 km per hour makes inaugural trip from Paris to Lyons. 12. Army officers hanged in Bangladesh in connection with the assassination of President Zia-ur-Rahman in May.

October

3. Seven-month-old hunger strike campaign for prison reforms by Irish Republican Army men in Belfast Maze Jail called off. 5. Commonwealth heads of Government set mid-1982 as target date for independence of Namibia from South African rule. 6. Egyptian President Anwar Sadat assassinated by a group of soldiers with grenades and assault rifles, during military parade in Cairo. 14. Mr. Hosni Mubarak sworn in Egypt's fourth President. 18. Polish Communist Party leader Mr. Stanislaw Kania sacked. 19. Socialist forces swept back to power in Greece. 24. Cancun summit of 22 Government leaders ends on note of uncertainty and lack of agreement.

November

1. Antigua and Barbuda become independent. 9. U San Yu, retired Army General, succeeds U Ne Win as President of Burma. 15. America's Columbia space shuttle lands safely after second flight. 16. Abdus Sattar elected President of Bangladesh. 18. U. S. President Reagen proposes to Russia an arms cut plan. 24. The Soviet President Brezhnev rejects Reagan's arms cut plan. 26. Revolt in Seychelles put down. 30. Arms reduction talks open in Geneva; Suneo Sonoda, Foreign Minister and 13 other Ministers dropped in Japanese Cabinet reshuffle.

December

7. Armed men hijack three Venezuelan airliners with 170 aboard. Hostages freed and hijackers surrender in Cuba on Dec. 9. Libyan airliner with 40 aboard hijacked by Lebanese demanding release of their leader Imam Moussa Sadiq supposedly detained in Libya. Hijack ends in Beirut on Dec. 10 when hijackers surrender. 12. Javier Perez de Cueller, 61-year-old former Chief delegate of Peru, elected U.N. Secretary-

General to succeed Dr. Kurt Waldheim. 13. Army takes over in Poland; emergency proclaimed and Solidarity leaders rounded up. 14. Israel enacts new law to annex Golan Heights, occupied Syrian territory. 20. Polish envoy in U.S. defects; US grants asylum; Israel cancels strategic co-operation agreement with US. 22. Saudi Arabia and Bahrain sign Security Pact. 24. U.S. President Reagan orders sanctions against Poland; Gen. Zia sets up advisory council for Pakistan. 29. America's first test tube baby (girl) born at Norfolk, Virginia. 30. President Reagan imposes sanctions against Russia for aiding the suppression of human rights in Poland. 31. Ft. Lt. Rawlings returns to power in Ghana overthrowing Dr. Limann in military coup; Libya resumes ties with Saudi Arabia after 14 months.

65. WONDERS OF THE WORLD

Seven Wonders of the Ancient World. The practice of listing the wonders of the world started with Antiper of Sidon, a Greek of the second century A.D. according to some scholars. Others attribute it to a Byzantine mathematician and traveller, Pilon in 150 B.C. Whoever started it, the list consisted of seven man-made structures.

The seven wonders of the ancient world were: 1. The Pyramids of Egypt. 2. The Hanging Gardens of Babylon. 3. The Temple of Artemis (Diana) at Ephesus. 4. The Tomb of Mausolus at Halicarnassus. 5. The Colossus at Rhodes. 6. The Statue of Zeus (Jupiter) at Olympia. 7. The Pharos (Lighthouse) at Alexandria.

Of the seven wonders enumerated by Antiper, only one—the Pyramids of Egypt—survive to this day more or less intact. Fragments of two other wonders—the Temple of Artemis at Ephesus and the Mausoleum at Halicarnassus—are traceable. The others have disappeared without a trace.

1. The Pyramids of Egypt. These royal tombs which housed the dead Pharaohs of Egypt are about 70 in number and lie on the west side of the Nile beginning at Gizeh (Gisa) opposite Cairo and extend south for some 60 miles or so. They represent 1200 years of Egyptian history.

Pyramid building in Egypt developed from the *mastaba* (a flat-topped mud or brick structure built over a burial chamber) which prevailed from the earliest days of Egyptian history. It was Pharaoh Djoser of the Third Dynasty who built the first stone mastaba, known as the *stepped pyramid*. A fourth dynasty Pharaoh Sneferu introduced the art of filling in the steps of the mastaba thus making the pyramid a smooth-shaped structure.

The pyramids mentioned by Antiper are three, all built by the Pharaohs of the Fourth Dynasty. These are the great pyramids at Gizeh consisting of 1. the Pyramid of Cheops (Kufu), 2. the Pyramid of Khefru (Chefren) and 3. the Pyramid of Menakaure (Mycerinius). The biggest pyramid is the Cheops pyramid now about 147 metres in height. It is built of some 2,300,000 blocks of stone each weighing about 2½ tons and put together with surface joints so perfectly cut as to rival the accuracy of modern commercial optics. The Pyramid of Khefru is 143 metres high and that of Menakaure around 67 metres.

2. The Hanging Gardens of Babylon were near the Euphrates river, in the palace of King Nebuchadnezzar, 60 miles south of the present city of Baghdad, and not far from the eastern border of the Syrian Desert of Northern Arabia. The terraced gardens, planted with flowers and small trees, with fountains and refectories interspersed, were 75 to 300 feet above the ground. Water was stored in a reservoir on the top terrace and was piped down to the gardens. They date from about 600 B.C.

3. The Temple of Artemis (Diana), in Asia Minor at Ephesus, an ancient but now vanished city, was south of Smyrna. It was built in the fifth century B.C. by the Ionian cities, as a joint monument from plans drawn by the architect Ctesiphon. The building was of marble, 425×225 feet and the roof was supported by 127 columns of Parian marble each 60 feet high and each weighing about 150 tons. In 356 B.C. the temple was burned by Herosratus, a crank.

4. The Tomb of Mausolus, King of Caria, in Asia Minor was at

Halicarnassus, on the eastern side of the Aegean Sea. It was built of marble about 352 B.C. by Queen Artemisia, the widow, and was remarkable for its beauty and its magnificent interior. It was destroyed by an earthquake.

5. **The Colossus at Rhodes** was a bronze statue of the Greek Sungod *Helios*, 70 cubits (about 109 feet) high, erected by Charles of Lindus at the port of the City of Rhodes on the island of Rhodes in the eastern part of the Mediterranean Sea. It was completed about 280 B.C. but was thrown down in an earthquake in 224 B.C. There it lay on the ground until 672 A.D. when the Turkish Government, having seized Rhodes, sold the statue and it was broken up.

6. **The Statue of Zeus (Jupiter)** was in the valley of Olympia, province of Elis, 12 miles or so inland from the west coast of the southern peninsula of Greece, which was then called the Peloponnesus.

The statue begun by the Greek sculptor Phidias after he had been banished from Athens in 432 B.C. was of marble encrusted with ivory and the draperies were of beaten gold. The bearded god was in a sitting posture, with an olive wreath on his head. In his right hand was the figure of victory, in the left, a sceptre.

7. **The Pharos of Alexandria,** a white marble lighthouse or watch-tower on the island of Pharos, in the port of Alexandria, Egypt was completed by King Ptolemy Philadelphus, 265-247 B.C. This lighthouse about 600 ft. in height was built by a Greek architect Sostratus of Cnidus and was the first of its kind in the world. The science of lighthouse construction called *Pharology* started with this lighthouse. *Pharos* simply means a beacon and even today the French word *phare*, meaning lighthouse, reminds one of the old Pharos of Alexandria.

OTHER WONDERS OF THE WORLD

The Sphinx, near Gizeh in Egypt, is a great wingless crouching lion hewn out of solid rock, 172.5 feet long, and 66 feet high. Between the two extended paws is a granite altar with inscriptions apparently indicating that it was built during the time of the Fourth Dynasty, around 2500 B.C.

The Great Wall of China, built in the third century B.C., extended along the northern frontier of the country, from the northern part of the Gulf of Chihli on the Yellow Sea, north of Peking, in a zigzag course, to Syning, on the border of Turkestan.

The total length of the Wall is 3219 kilometres or about 2000 miles. It has a height of 6 to 15 metres and a width of 4.5 to 7.6 metres. The Towers erected at intervals in the Wall are 9 metres high and 6 metres wide.

Stonehenge is a circular assemblage of huge, shaped stones in Salisbury plain about 90 miles south west of London. The stones are arranged in two circles one within the other. The outer circle is 100 feet in diameter and the inner 75 feet. The stones in the outer circle were fastened together in couples by blocks fixed across the tops. It appears to have been put up between 1800 and 1500 B.C., presumably for religious purposes. The name Stonehenge is a corruption of Stan-hangest (stone horse).

The Catacombs at Rome were the sepulchres of the early Christians, and consisted of more than 40 groups of labyrinths, or galleries and chambers, covering 615 acres, sometimes going down to 5 storeys (70 feet) below the surface of the ground.

The Circus Maximus, at Rome, built 605 B.C. by King Tarquin and rebuilt and enlarged by Julius Caesar, was 312 feet high, 1875 feet long and 625 feet wide. It then held 150,000 spectators, but the capacity was increased to 385,000 in the fourth century A.D. The place was used for games and for horse and chariot races.

The Coliseum, or Colosseum, at Rome, one of the largest amphitheatres in the world, was begun by the Emperor Vespasian and finished by the Emperor Domitian in 82 A.D. In 238 A.D. a fourth storey was added. The ruins still stand. The building, elliptical, was 615×510 feet. The walls were of stone, the seats marble. Fifty thousand persons could sit and 20,000 stand.

The Coliseum is notorious in history as the place where unarmed Christians were made to confront wild animals like lions and tigers in a 'kill or be killed' fight.

Hagia Sophia or the Church of St. Sophia at Constantinople (Istanbul) was built as a Christian cathedral by the Roman Emperor Justinian in 531-538

A.D. It was designed in the form of a Greek cross 269×143 feet with a flattened dome 180 feet high set in a cluster of cupolas and minarets. It was the most celebrated Christian church of the times. In 1453 Constantinople fell to the Sultan of Turkey who converted Hagia Sophia into a mosque. It was as a mosque that Hagia Sophia acquired the tall pinnacles that surround the central dome today. Hagia Sophia is now a museum.

The Leaning Tower of Pisa is one of the so-called wonders of the Middle Ages. It is a round, 8-storey bell-tower and was built of marble in 1154 A.D.; it is 188 feet high, and the top is 16 feet out of the prependicular. There are other leaning towers at St. Moritz, Ems, Ulm, Asinelli and Garisenda.

The Porcelain Tower of Nanking was built in that ancient capital of South China in the early part of the 15th century. It was an octagonal 8-storey tower, 261 feet high. The Taiping revolutionists destroyed it in 1853.

The Taj Mahal at Agra, popularly called The Taj, is a masterpiece of architecture that easily takes its place among the Wonders of the World. It is a mausoleum built by the Mughal Emperor Shah Jehan over the tomb of his wife, Empress Mumtaz Mahal. Its construction was started in 1631 and completed in 1653.

The Taj marks the high-water mark of Indo-Persian architecture. It is a domed structure rising above a basement, which itself rests on a great platform or terrace. The keynote of the general layout of the complex lies in the formal garden within the inner court, with a central tank and canals. The garden consists of 4 flowerbeds surrounded by shallow canals studed with fountains, all radiating from the central tank like the arms of a cross. The Taj occupies the northern extremity of this garden, with the River Jamuna at the back.

In shape, the Taj is an irregular octagon with four long and four short sides. Graceful minarets rise from the four corners of the basement. Four magnificent *Chhatris* or kiosks surround the majestic central dome, which is estimated to weigh 12,192.56 metric tons.

The whole structure is done in pure white marble, with the inner walls or partitions exquisitely ornamented and inlaid with precious stones.

The salient features of the Taj are the broad and superb construction, pure and soft outlines, and luxuriant execution which make it an unparalleled creation of beauty and splendour. The whole complex is so planned that its apparent organic unity does not obscure the individuality of any unit.

Angkor Wat or Nakhon Wat is a temple in Cambodia, dedicated to Vishnu. It was built during the reign of Suryavarman II. The temple and its enclosure cover an area of 1303×1499 metres. The temple itself is at the top of a series of terraces dotted with smaller temples. The first terrace is 45 feet high. Thousands of sculptures decorate the passages between the shrines on every terrace. The central tower crowning the whole complex is 215 feet high.

The temple is situated south of the Angkor city which was the capital of ancient Cambodia. The city, built between 800 and 1200 A.D., is magnificent in its own right. Both the city and the temple appear to have been abandoned around 1500 A.D. The forests advanced upon them and overwhelmed them. In 1858 a French naturalist, Henri Mouhout, discovered the ruins in the jungle and they, or what remained of them, were restored. The city and the temple testify to the spread of Indian culture in south east Asia.

The Alhambra at Granada in southern Spain was built by the conquering Arab Moors who established a Caliphate in Spain with Cordoba as the first capital. When the Christians reconquered Cordoba, the Caliphate capital was removed to Granada. The Alhambra consists of a fortress whose walls and towers are in red stone and called *Kalat al hambra* (red fort) within which are the *Alcazba*, a citadel and *Alcazar*, a palace. This complex of courts and halls, pools and gardens has been described as an 'Arabian Nights Fantasy'. Its architecture is slim and graceful, with slender columns, denticulated arches and exquisite traceries.

Shwe Dagon or the Golden Pagoda is a Buddhist shrine in the outskirts of Rangoon in Burma. It was probably built late in the 13th century or early in the 14th. The spire of the pagoda which was once studded with real emeralds, rubies and other precious stones was added in the 18th century. In 1871 King Mindon

Min spent £4.5 million in covering the main dome in gold. The pagoda is built on a mound rising 55 metres and covers an area of nearly 6300 sq. metres. The spire of the pagoda rises 98 metres from the base. The pagoda is especially sacred to Buddhists because it enshrines 8 of Buddha's hairs which were brought to Burma by two of his disciples.

66. THE SUPERLATIVES

This section covers world phenomena which belong to the class of Superlatives.

Natural Phenomena

Lightest Gas: Hydrogen

Lightest Metal: Lithium

Highest Melting Point: Tungsten 3410° C.

Hardest Substance: Diamond

Largest Diamond (cut): Star of Africa, set in the British Sceptre. Weight: 530.2 metric carats with 72 facets cut from the Cullinan diamond.

Pearl: Pearl of Allah or Pearl of Lao-Tse: Length 9½ in. diameter 5½ in. weight 14 lb 1 oz. Recovered from a giant clam from the Philippine Seas.

Meteorite: Length 9 ft. Breadth 8 ft. Weight 132,000 lb. Recovered from Hoba, near Grootfontein in South West Africa.

Largest Freshwater Lake: Lake Superior (USA and Canada)—31,820 sq. miles.

Highest Navigable Lake: Lago Titicaca (Peru-Bolivia) at 12,506 feet above sea level. Area 3200 sq. miles.

Deepest Lake: Lake Baikal (USSR) maximum depth 6365 feet, that is, 4872 feet below sea level.

Greatest Ocean Depth: Off the Island of Mindanao, the Philippines—37,782 feet.*

Longest Strait: Strait of Malacca (between Malaysia and Sumatra—Indonesia)—485 miles long.

Broadest Strait: Mozambique Strait (between Mozambique & Madagascar)—Maximum breadth 245 miles.

Narrowest Strait: Between the Greek mainland and the island of Euboea in the Aegean Sea. Narrowest point at Chalkis—45 yd.

Largest Bay: Hudson Bay, Canada—Shoreline 7623 miles.

Largest Gulf: Gulf of Mexico Shoreline—3100 miles

Greatest Tides: Bay of Fundy, Nova Scotia—53 ft

Greatest Flow: Amazon—average flow 4,200,000 c. ft per second, flood flow 7,000,000 cusecs (c. ft per second).

Largest River Basin: Amazon basin—2,720,000 sq. miles.

Largest Delta: Sunderbans (India and Bangladesh) formed by Ganga and Brahmaputra rivers—30,000 sq. miles.

Widest Waterfall: Khone Falls (Laos), width 6.7 miles. Flow 1,500,000 c. ft per second. Height 50-70 feet.

World's Rainiest Spot: Cherrapunji, India—1 month 366.14 in. (Record in July 1861), 1 year 1041.78 in. (Record in Aug. 1860 to July 1861)

Highest Town: Wenchuan, Tibet—16,732 feet.

Highest Village: Aucanquilca, in Andes Mountains, Chile—17,500 ft.

Lowest Town: Villages along the Dead Sea—1269 feet below sea level.

Largest Gorge: Grand Canyon, Colorado river, Arizona—217 miles long, 4 to 13 miles wide, 1 mile deep.

Deepest Gorge: Hells Canyon, Snake River, Idaho—7900 feet deep.

Biggest Meteor Crater: Barrington Crater, Arizona, USA—4150 feet diameter.†

Largest Island: Greenland, area 84,000 sq. miles.

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* In 1962 soundings by H.M.S. Cook off Mindanao, in the Philippines, showed a depth of 37,782 feet. This was announced by the British Admiralty in Nov 1962.

† See Box 25.

Largest Archipelago: Indonesia, over 3000 islands

Largest Peninsula: Arabia—area 250.000 sq miles

Highest Peak: Mount Everest (Nepal-Tibet) 29.028 ft

Highest Plateau: Tibet.

Largest Animal: Blue whale. Longest recorded length, 106 feet, Highest calculated weight—195 tons

Longest Life-span of Animals: Giant tortoise—190 to 200 years.

Largest Land Animal: African elephant—height (average) 10 feet 6 in., weight (average) 6½ tons.

Tallest Land Animal: Giraffe. Highest recorded height—19 feet 3 in. Highest recorded weight—3800 lb

Swiftest Bird: Spine-tailed swift. Highest speed recorded—106.25 mph.

Fastest Animal: Cheetah—short run speed 70 mph. Long run speed—(over 500 yrds) 44 mph

Longest Jump: Kangaroo—12.80 metres.

Largest Bird: Ostrich—Weight 135 kg. Height 2.40 metres. Running speed 50 km per hour.

Smallest Bird: Humming bird—Wing span 1½ in., weight 2 grams, overall length—2.2 to 2.6 in.

Longest Wing Spread: Albatross, wing span—3.70 metres.

The Slowest Animal: Snail—0.03 mph.

Heaviest Domestic Dog: St. Bernard. Heaviest weight on record 295 lb.

Tallest Domestic Dog: Irish wolf-hound—height 39½ in.

Smallest Domesticated Dog: Chihuahua—average weight 2 to 4 lb, some weigh as low as 16 oz.

Fastest Dog: Persian grey-hound—speed up to 43 mph.

Longest Snake: Anaconda, South America—37½ feet.

Longest Poisonous Snake: King Cobra or Hamadryad—18 feet 4 in

Fastest Snake: Black Mamba of Africa—20 mph.

Biggest Leaves: The Rafia palm, a native of Madagascar, has the biggest leaf. Its mammoth pinnate leaf is about 22 m. long and 12 m. wide, with a leaf stem 5 m. long.

Biggest Flower: Rafflesia, a native of the island of Java, produces the biggest flower. Its fleshy red and dotted flower of five lobes is up to 1.5 m. in diameter. Rafflesia is a parasite on the roots of tropical trees. Its flowers grow from under the bark of the host plant like buds and open out into flowers.

The Largest Tree: Sequoia tree named 'General Sherman' in Sequoia National Park, California. Height—272 feet 4 in. Base circumference—101 feet 7 in. Base diameter, maximum—34 feet. Total volume 49,660 cubic feet.

The Oldest Tree in the World: The Mein Yuch (Sleeping Moon) sacred tree on Mound Ali in Central Taiwan, is officially estimated to be 4128 years old. The tree is still living and full of verdure. Vital statistics; Height 48 metres—Circumference around the bust 20 metres—around the stump 20.9 metres—Diameter of the bust 6.37 metres—the stump 6.66 metres. Bulk of the tree, above the ground 6155 cubic metres. This tree is older and larger than the famous Alishaw Sacred Tree (also in Taiwan) which is reputed to be 3000 years old and dying.*

II. Man-made Structures

Tallest Building: Sears Tower, Chicago, 1454 feet in height with 110 floors. Higher than the Empire State Building (1250 feet) and World Trade Centre (1350 feet), both of which are in New York

Largest Residential Palace: Vatican Palace, covering an area of 13½ acres. It has 1400 rooms, halls and chapels.

Largest Stadium: Strahov Stadium in Prague (Czechoslovakia) Accommodates 240.000 spectators.

* News report, *Indian Express* June 21, 1971

Tallest Tower: Tallest self-supporting tower—C.N. Tower in Metro Centre, Toronto. Ht. 555.33 metres

Largest Concrete Dam: Grand Coulee Dam on the Columbia river, Washington (USA)—crest length 4173 feet, height 550 feet.

Longest River Dam: Hirakud Dam on the Mahanadi river, Orissa, India. Total construction length—15.8 miles.

Largest Reservoir: Bratsk Lake on the Angara river, USSR. Vol. 137,230,000 acre-feet.

Largest Railway Tunnel: Simplon II—tunnel linking Switzerland and Italy under the Alps—12 miles 559 yards long.

Largest Road Tunnel: Mt. Blanc, France—Italy, 7.2 miles.

Larget Dome: (New Architecture) 'Astrodome' Harris County Sports Stadium in Houston, Texas. Outside diameter 710 feet, inside diameter 642 feet.
(Old architecture). Gole Gumbaz Bijapur (Karnataka) India, 144 feet diameter.

Largest Mosque: Jama Masjid, Delhi (India). Area 10,000 sq. ft.

Largest Church: Basilica of St. Peter, Vatican, Italy. Area—18,110 sq. yd.

Tallest Minaret: Qutb Minar, Delhi, India—238 feet high.

Tallest Church Spire: (i) (New Architecture)—Chicago Temple of the First Methodist Church—568 feet high.
(ii) (Old Architecture)—Ulm Cathedral, Germany—529 feet (highest point).

Biggest Bell: Great Bell at Moscow cast in 1733—weight 216 tons. Diameter 22 feet 8 in. Height more than 19 ft. Greatest thickness 24 in. The bell is cracked and a portion weighing 11 tons has broken off.

III. Worst Disasters

Air: (i) March 27, 1977. Two Jumbo Jets collided near Santa Cruz airport in Teneriffe, Canary Islands, killing 563 people.
(ii) The second worst air disaster occurred on March 3, 1974 when a Turkish D.C. Jet plane crashed near Paris killing 345 people.

Sea: (i) Feb. 18, 1945. The ship Wilhelm Gustloff (25,484 tons) sank off Danzig, killing 4120 people.
(ii) April 15, 1912. The wreck of the *Titanic* in North Atlantic outstrips all other disasters of the sea for its sheer drama. The *Titanic* was on its maiden voyage. Sumptuously equipped, it carried a select crew and elite passengers. It struck a floating iceberg and sank killing 1052 people. The Captain and the officers went down with the ship, to the tune of a solemn song, in the best romantic tradition.

Rail: (i) Dec. 12, 1917. A troop train derailed at Modane, in France, killing 550 people.
(ii) March 12, 1944. The Salerno disaster killed 512 people, in an accident the sort of which had never before happened in railway history.
The engine stalled while the train was in the middle of a long tunnel. What little oxygen there was in the tunnel, was used up by the passengers, in a matter of minutes. Then they started to gasp for air like stranded fish and one by one died of suffocation. Help came too late.

Earthquake: Jan. 23, 1556, in Shensi province, China. Lives lost estimated at 830,000.

Volcano: May 8, 1902. The eruption of Mount Pelee, Martinique, West Indies, wiped out the City of St. Pierre and killed an estimated 400,000 people.

Flood: Aug.—Oct. 1931. The Yangtze river in China flooded killing about 3,700,000.

Famine: 1877-78. The famine in N. China took a toll of some 5,500,000 lives.

Fire: (i) 1666. The Great Fire of London. Though no statistics of death is available, the Great Fire of London takes precedence as the greatest fire in recorded history. It raged for 5 days from Sept. 2 to Sept. 6. It destroyed many public buildings, 89 churches and over 13,200 houses. Those rendered

Box 25

The Biggest Meteor Crater

It was believed until a few years ago that the meteor (meteorite) crater Canyon-Diabolo in Arizona (USA) was the biggest meteor crater in the world. This is also what the Guinness Book of Records (1971-72 edn.) states. Information since available about the Lonar crater in Maharashtra (India) indicates that it is the biggest meteor crater now known.

Scientists of the Geological Survey of India and the Smithsonian Institute of Washington have recently (1979) carried out an elaborate study of the Lonar crater in Mehkar taluka of Buldhana District in Maharashtra. Comparative data on the Arizona and Lonar craters are given below:

Crater	*Arizona*	*Lonar*[*]	
Diameter	*4150 ft.*	*5905 ft.*	*(1800 m.)*
Depth	*575 ft.*	*558 ft.*	*(170 m.)*
Height of the Rim	*130–155 ft.*	*66 ft.*	*(20 m.)*
Age of the Crater	*27,000 years*	*50,000 years.*	

The Lonar crater is believed to have been formed by the impact of a huge meteorite about 60 metres across and a million tonnes in weight. It is also thought that while the meteorite that formed the Arizona crater was an iron meteorite, the Lonar crater was formed by a stony meteorite (see Part I S. 21). The age of the Arizona crater is about 27,000 years as against the Lonar crater which is about 50,000 years old. The Arizona crater is now dry while the Lonar crater is filled with brackish water.

The Lonar crater is unique in two respects. It is the only known example on the Earth of an impact crater in basalt. Secondly, it reveals many characteristic features of the lunar craters. Samples of the strata which the Lonar meteorite originally struck were obtained by drilling 100 metres below the bottom of the crater. "The operation has yielded a rare mineral maskelynite which is the transformed plagioclase feldspar when subjected to shock. Around the rim of the crater are scattered glass splinters from 10 cm to 15 cm in length as well as spherules. These closely resemble the glass pieces and spherules collected by Apollo astronauts on the moon." (**India Today**, *Aug. 1-15, 1979).*

Scientists have noticed that the south-western wall is much steeper than the rest. Their inference is that the meteorite must have struck the earth at a low angle from the north-east and might be lying embedded under the south-western rim. The inner sides slope at an angle of 60 degrees while the rim slopes outward gently at 15 degrees.

The hidden meteorite in the case of the Lonar crater is probably buried about 600 metres below the crater level. Efforts to locate it have not yet been made by the Government because of the sheer magnitude of the effort that will have to be put in and the doubtful material returns that will result.

There is much confusion regarding meteor craters. They are often confused with craters formed by volcanic activity. The Lonar crater itself was at first thought to be volcanic in origin. Later it was found that volcanic activity had ceased in the Indian peninsula long before the Lonar crater was formed. Thus it was that it (the Lonar crater) was identified as a meteor crater. There are many craters that were formed by volcanic action. The New Quebec crater in Labrador, Canada, is one such. This crater about 10,000 m across is now filled with water several metres deep. This scientists think that this crater was more likely to have been caused by volcanic action that by the impact of any meteorite. Similarly, the Bosumtwi crater in Ghana is thought to be a meteorite scar which belongs to a particular class of phenomena known as **astroblemes** *among astronomers. There are a number of similar meteorite scars all over the world, the biggest of which is the Vredefort Ring about 43 miles wide in South Africa. Among all this confusion, the Arizona and Lonar craters stand out as craters which have been proved beyond doubt to be caused by the impact of meteorite.*

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[*] An earlier report put down the diameter at 6003 ft. (1830 m.) and the depth at 492 ft (150m)

homeless numbered 200,000. (ii) May, 1845. The worst fire reported in a single building occurred in a theatre at Canton, China, killing 1670 people.

Epidemic: 1347-51. The Black Death. An epidemic of bubonic plague killed off an estimated 57,000,000 people in Europe.

67. SOBRIQUETS

Sobriquets are secondary names (including nicknames) that become attached to certain persons, places or things. Thus the Bank of England is known as the 'Old Maid of Threadneedle Street', and the *Malayala Manorama*, the oldest newspaper of Kerala as 'the Granny of Kottayam'. Bismarck was known as the 'Man of Blood and Iron' and Florence Nightingale is famous as 'the Lady with the Lamp'. Tippu Sultan of Mysore is still spoken of as the 'Mysore Tiger'.

Some names, as H. W. Fowler observes, "have a large retinue of sobriquets. Rome, for example, may be the Eternal City, the City of Seven Hills, the Papal City, the Scarlet Woman, the Scarlet Whore, the Empress of the Ancient World, the Western Babylon". (M.E.U.)

Sobriquets	Primary Names
Bengal's Sorrow	River Damodar, Bengal, India
Blue Mountains	Nilgiri Hills, India
Britain of the South	New Zealand
City of the Golden Gate	San Francisco, USA
City of the Golden Temple	Amritsar, India
City of Dreaming Spires	Oxford, England
City of Magnificent Distances	Washington, D.C., USA
City of Palaces	Calcutta, India
Cockpit of Europe	Belgium
Dark of Continent	Africa
Emerald Island	Ireland
Empire City/ City of Skyscrapers	New York, USA
Forbidden City	Lhasa, Tibet
Garden of England	Kent, England
Garden of India	[redacted]lore → Mangalore
Gate of Tears	Bab-el-mandab
Gateway of India	Bombay
Gift of the Nile	Egypt
Granite City	Aberdeen, Scotland
Great White Way	Broadway, New York
Herring Pond	Atlantic Ocean
Holy Land	Palestine
Island of Cloves	Madagascar
Island of Pearls	Bahrain
Key of the Mediterranean	Gibraltar
Land of Cakes	Scotland
Land of the Golden Fleece / Land of the Kangaroo	Australia
Land of the Golden Pagoda	Burma
Land of Lilies / Land of Maple	Canada
Land of Morning Calm	Korea
Land of the Midnight Sun	Norway
Land of the Rising Sun	Japan
Land of Rivers	Punjab, India
Land of Thousand Lakes	Finland
Land of the White Elephant	Thailand

Never Never Land	Prairies of N. Australia
Pearl of the Antilles	Cuba
Playground of Europe	Switzerland
Powder Keg of Europe	Balkans
Quaker City	Philadelphia
Queen of the Adriatic	Venice, Italy
Queen of the Arabian Sea / Venice of the East	Cochin, India
Roof of the World	Pamirs
Rose Pink City	Jaipur, India
Sick Man of Europe	Turkey
Sorrow of China	River Hwang Ho.
Spice Garden of India	Kerala
White City	Belgrade, Yugoslavia
White Man's Grave	Guinea Coast
Windy City	Chicago, USA
World's Bread Basket	Prairies of N. America
World's Loneliest Island	Tristan da Cunha
City of dreams	Los Angles.

68. MINERAL RESOURCES

Minerals have played a leading role in the evolution of civilization. Long before man discovered (or invanted?) agriculture, he had discovered minerals. They lay handy all around him—pebbles and pieces of rock. For centuries, these had been his mainstay. Our stone age ancestors were so called, because they carved their tools out of stone. This was the first mineral that man had put to use.

Then came other discoveries, metals like copper and iron. These have been so important to civilization that we have named epochs of history by them—Copper age, Bronze age, Iron age, etc. The process of discovery went on with accelerated momentum—new minerals, new alloys and new uses. Today we have about 2000 different varieties of minerals—metals and non-metals—and a host of alloys.

Minerals may be classified as Metal, Non-metal and Fuel minerals.

Gemstones, though coming under the broad classification non-metals, deserve to be classed separately. (see below).

Fuels. The main fuels are coal, natural gas and petroleum. (see below).

MAJOR MINERALS

Aluminium, the third most extensively consumed metal, is the most plentiful of all metals. It comprises 8.1 per cent of the earth's crust as against 5 per cent represented by iron. The major ore of aluminium is bauxite. But aluminium is present in different forms in all alumina minerals.

Though commercial production of aluminium started only in the present century, it is fast displacing other metals in various manufactures like shutters, sidings and utensils. It is very light and has high conductivity and is therefore in great demand in aircraft production and electrical industries.

Antimony, a metal used in printing types and in medicines and pigments.

Apatite, a phosphatic compound used in fertilisers, matches and chemicals.

Asbestos, sometimes known as 'rock cotton', is a group of minerals that can be spun into fibres. They are fire-resistant and are used in roofing, piping and other fittings.

Barytes, also known as 'heavy spar', is a sulphate of barium and is used in smelting iron and manganese and for all barium chemicals.

Bauxite, the chief ore of aluminium, is used in refractory and chemical industries.

Bentonite possesses decolouring and purifying properties and is mainly used as a purifier and filler.

Beryllium, derived from beryl, is rare and costly. It is light and can withstand high temperatures. It is used as an alloy with copper and in X-ray tubes

Borax, in the form of boric acid and borates, is used for vitreous enamels, ceramic glaze, in brazing and welding and in medicines and cosmetics.

Cadmium, a scarce metal, is used in electroplating, glass, paints and in storage batteries.

Calcite, also known as 'Calcspar', is a naturally occurring carbonate of calcium and is used in textiles, paints, ceramics, bleaching powder etc.

China clay or Kaolin is used in industries like ceramics, refractories, textiles, paper, pesticides and others.

Cobalt imparts magnetic properties and is used as an alloy with other metals.

Copper, the oldest metal discovered by man, is extensively used for various purposes and comes next to steel in annual consumption. Some 240 mineral ores contain copper in varying percentages, but the best known ores are **Chalcopyrite, Azurite** and **Malachite**. Malachite is an ornamental stone as well.

The high electrical and thermal conductivity of copper makes it indispensable to the electrical industry which consumes about 50 per cent of the total production. Its malleability and corrosion-resistance make it an ideal alloy with other metals. *Brass* (copper and zinc) and *bronze* (copper and tin) are two of the oldest and commonest alloys of copper.

Cryolite is mainly used in the extraction of aluminium from ore and also in ceramics and glass industries.

Dolomite is a double carbonate of calcium and magnesium and is mainly used in iron and steel, refractory and glass industries

Felspar is used in the manufacture of earthenware, sanitaryware, enamelled bricks, opalescent glass, etc.

Fireclay is a refractory clay of sedimentary or residual origin. It is mainly used in the manufacture of refractory bricks for high temperature furnaces.

Flourspar or fluorite is used in enamelling iron, for finishing enamelware like bath-tubs, as a fluxing material in the manufacture of steel, etc

Fuller's Earth, so called because it was formerly used for 'fulling', i.e., cleaning woollen fabrics and cloth, is a natural bleaching clay. It is used in refining petroleum, vegetable oil and in the preparation of cosmetics.

Gold, the king of minerals, is used in jewellery, as currency reserve and for industrial purposes. Pure gold being too soft is often alloyed with copper, silver, nickel or palladium.

Graphite, also known as plumbago or black lead, is a variety of naturally occurring carbon. It is opaque, extremely resistant to the action of acid and a good conductor of both heat and electricity. It is used in the manufacture of crucibles, in paints and pigments, in foundry facings and for pencil manufacture.

Ilmenite is one of the commercial sources from which the rare metal titanium is derived. It carries about 30 per cent titanium. Ilmenite is used in the production of white pigments, titanium metal and ferro-titanium.

Iron and Steel. Iron is the most extensively consumed metal to-day. Its natural supply is also abundant. It accounts for some 5 per cent of the earth's crust. Pure iron is too soft for use. So, it is hardened by the addition of carbon to form steel and cast-iron. A number of minor metals are used as alloys of steel so as to endow it with additional physical properties. The most common among them are: **Chromium, Cobalt, Manganese, Molybdenum, Nickel, Silicon, Tungsten** and **Vanadium.** These in different combinations and proportions enable steel to perform very different functions

Kyanite is an aluminium silicate and is an important refractory mineral.

Lead is recovered from the natural ore galena and is an excellent sound and vibration absorbent. Lead has wide ranging industrial applications. It is used as an alloy with other metals, principally antimony and tin. It is used in brasses and bronzes, type-metal, diecasting, water pipes and in the manufacture of pigments.

Magnesium, one of the lightest metals known, is mostly used as an alloy of steel and aluminium. It is specially used in photography, machine tools, conveyor belts, flash bulbs and for flares.

Mercury is one of the heaviest metals and is unique in its being the only metal in liquid form. Mercury is derived from the mineral cinnabar which is a sulphide of mercury. Mercury has diverse uses in industry. It is used in explosives, pigments, paints, printing inks, medicines, dye-stuffs and in other chemicals.

Mica. Two varieties of mica find use in electrical and electronic industries.

Monazite is a phosphate of the rare earths, a portmanteau compound carrying some 15 rare earth minerals. The strategic metals derived from the monazite sands are **titanium, uranium, thorium** and **zirconium.**

Molybdenum, a hard metal with a high melting point, is mainly used as an alloy with iron and steel. It is a good electrical and thermal conductor and a corrosion-resistant.

Nickel is essential in the production of stainless steel. It has very high corrosion resistance and finds application in electroplating, chemical and ceramic industries.

Ochre is a group of natural pigments and occurs in various shades, chiefly yellow, red, green and brown. It is used in colour washes, distempers, oil paints and coloured papers.

Pentlandite, a nickel-iron sulphide, is used in steels and alloys.

Platinum, perhaps the costliest metal, is usually found in the natural state with a number of other allied metals—**palladium, iridium, osmium, rhodium** and **ruthenium.** Hardened with iridium or ruthenium, platinum is used in jewellery, laboratory equipment, dentistry, electrical industry, etc.

Quartz or Silica is the most common mineral on the earth's crust. It is chiefly used in glass manufacture and in making refractory bricks for glass furnaces and coke ovens.

Rutile. Rutile, like ilmenite, is a source of titanium. Rutile contains nearly 60 per cent titanium. Rutile is mainly used in the production of arc-welding electrodes.

Salt, either in the form of sodium chloride (common salt) or along with carbonates of calcium and magnesium and their sulphates, occurs in sea water in brine springs, wells and salt lakes and in rock salt deposits. Salt, apart from its use in culinary preparations, finds extensive use in chemical industries.

Saltpetre or Potassium nitrate is chiefly used in the manufacture of explosives.

Silver is used in coinage, plate and jewellery and in various industries—photographic, chemical and electrical.

Silimanite, like kyanite, is a refractory mineral used in glass, ceramic, cement, chemical industries etc.

Steatite or soapstone or talc is a hydrous silicate of magnesium. Massive steatite is cut into panels and used for switchboards, acid-proof table-tops, laboratory, laundry and kitchen sinks, as well as for linings for furnaces and stoves. Talc powder is extensively used in paint industry, manufacture of porcelain, asbestos products, textiles, polishes and soaps. The purest white kind, known as French chalk, is used in cosmetics and toilet preparations.

Sulphur or Brimstone is a major constituent in many industrial processes—in the manufacture of sulphuric acid, paper, insecticides and rubber vulcanization.

Tantalum has the strength of steel and is the outstanding metal for corrosion resistance. It is used in precision equipments and surgical instruments.

Tin is often confused with iron in popular nomenclature like 'tincan'. Tin is only the bright polishing on iron containers. It is extracted from the mineral ore cassiterite and is used in tin-plating, solders, bronzes, pewter and silk stockings.

Titanium—a silvery white metal occurring naturally in the form of ilmenite—is comparatively light. It is now extensively used in aircraft construction. Titanium and its alloys have a high degree of corrosion-resistance. But being a costly metal, it is not used in cheap manufactures where it is eminently suitable

Tungsten, one of the hardest metals known, has the highest melting point of all metals (3410°c). It is twice as heavy as iron or steel, has better electrical conductivity than steel and is also a good thermal conductor. It is familiar to all as the incandescent wire in our electric bulbs. It is used in X-ray tubes, photograph needles and others

Uranium—basic to atomic research—is not found in the free state but occurs in over 100 minerals. Pitchblende containing uranium oxides and torbernite (hydrated copper uranium phosphates) is a rich source of uranium.

Zinc is derived from the natural ore sphalerite which frequently occurs with galena the chief ore of lead. Zinc is used in castings, galvanising iron, in brasses and as oxide in paints, ceramics, rubber and cosmetics.

Zircon, a silicate, is a precious stone. As oxide it is used in refractories and ceramics. Zirconium metal is used in steel alloys and wireless valves.

Leading Producers of Metals

Aluminium	USA, USSR, Canada, Japan, Norway.
Copper	USA, USSR, Zambia, Chile, Canada, Japan, Australia.
Gold	South Africa, Canada, USA, Ghana.
Iron Ore	USSR, USA, France, Australia, Canada.
Lead	USA, Australia, USSR, Canada, Mexico.
Manganese Ore	USSR, South Africa, Brazil, India, Gabon.
Steel	USA, USSR, Japan, West Germany, UK.
Tin	Malaysia, Bolivia, USSR, Thailand, China.
Zinc	Canada, USSR, Australia, USA, Peru.

69. GEMSTONES

Gemstones are select varieties of precious stones that possess attractive colours, sparkle or translucence. They appeal mainly to our aesthetics or sense of beauty. They are highly priced because they occur only in limited quantities in nature.

All gemstones are precious stones but all precious stones are not gems. Diamond, the king of precious stones, is prized as a gemstone only if it has four essential qualities—colour, cut, clarity and carat (weight)—the four Cs as they are called. Only a small percentage of diamonds, around 25 per cent of the total production, qualify as gems. Among diamonds tinted varieties command a much higher price than the common white (colurless) variety because they are so very rare. The famous Hope diamond is steel blue, the Dresden diamond is greenish and the Williamson diamond, a delicate pink. The diamond known as the Moon of Baroda is canary yellow, while the Black Orloff is gunmetal grey.

All precious stones are distinguished by their extreme hardness which is measured on Moh's scale. Diamond, reputedly the hardest, measures 10 on Moh's scale, while ruby and sapphire come second at 9. At one time, diamond, ruby and sapphire alone were considered precious stones and all others were categorised as semi-precious. There is no such distinction now. Instead, precious stones are broadly classified to-day as gemstones and industrials. Industrials include not only diamonds used in industry but all precious stones similarly used.

Three types of gems, **amber, coral** and **pearl** are not minerals in the strict sense because they are organic substances. But since they possess some of the special qualities of gemstones they are classed as gems.

The popular names of gems are misleading. For example, what is known as Brazilian emerald is really a deep green tourmaline and Brazilian sapphire, a clear blue tourmaline. Many quartzs are known as topaz. Oriental topaz is really a yellow variety of sapphire and Spanish topaz is orange-brown quartz. An yellow variety of quartz is known by a host of names—Bohemian topaz, Indian topaz, Madagascar topaz and so on.

The colours noted below are the classic or the most commonly found colours. Some precious stones show peculiar colours which they derive from the impurities contained in them. Thus Jasper is brown because of manganese oxide, red on account of ferric oxide and yellow due to hydrous ferric oxide.

Table 54

Name	*Hardness (Moh's scale)*	*Birthstone (if any)*	*Description & Occurrence*
Agate	6.5-7.0	. . .	A striped chalcedony/opaque white to pale grey/Brazil, Germany, India, Madagascar.
Alexandrite	8.5	. . .	A chrysoberyl/dull green in daylight but blood red by artificial light/Brazil, Moravia, U.S.A., Urals (U.S.S.R.).
Amber	2.0-2.5	. . .	An organic substance, fossilised resin/honey yellow or pale yellow or cloudy/Baltic & Sicily coasts.
Amethyst	7.0	February	A violet variety of quartz/purple/Brazil, Sri Lanka, Germany, Madagascar, Uruguay, Urals.
Aquamarine	7.5-8.0	March	A variety of beryl/sea green or pale limped blue/Brazil, Columbia, Norway, Urals.
Bloodstone or Blood Jasper	6.0-7.0	March (alternative to aquamarine)	A variety of chalcedony/dark green with red spots (oxide of iron), scattered occurrence.
Cairngorm	7.0	. . .	A variety of quartz/smoky yellow to brownish/Brazil, Madagascar, Scotland (Cairngorm Mountains), Switzerland, U.S.A., Urals.
Cat's Eye	8.5		A variety of chrysoberyl/yellowish to brownish green/scattered occurrence.
Chrysoprase	6.5-7.0	May (alternative to emerald)	A chalcedony/applegreen/Germany, U.S.A.
Coral •			Skeletons of coral polyps/of many colours but gem varieties are found only in a few colours red, pink, gold and black/Mediterranean Sea, Pacific and Indian Oceans.
Cornelian also wrongly spelt Carnelian	6.5-7.0	July (alternative to ruby)	A chalcedony/reddish or yellow reddish/widespread occurrence.
Diamond	10.0	April	A form of crystalline carbon/colourless/South Africa, India, Brazil, Liberia, Sierra Leone, Urals.
Emerald	7.5-8.0	May	A silicate of beryllium and aluminium/rich green/Austria, Brazil, Colombia, Norway, Urals.
Garnet	7.5-8.0	January	Silicates of aluminium, calcium, magnesium, titanium, iron/purplish red, green variety 6.5-7.0 (Moh's scale), black variety 6.5 (Moh's scale).
Jade	6.5-7.0		A general name loosely used to include various mineral substances of tough texture and green colour. It includes *jadeite* which is dark to leek green in colour and *nephrite,* an inferior form/Burma, China, Tibet.
Jasper	6.5-7.0		A chalcedony/brown (manganese oxide) red (ferric oxide) yellow (hydrous ferric oxide)/U.A.R., India
Lapis Lazuli	5.5-5.75	**September** (alternative to sapphire)	A silicate of aluminium and sodium, opaque, deep azure blue/Afghanistan, Chile, Tibet
Moonstone	6.0-6.5	June (alternative to pearl)	A form of feldspar, irridescent, white to bluish/Brazil, Burma, Sri Lanka

• See Box 25

Onyx	6.5-7.0		A variety of silica, which consists of layers of different colours white, black and red. The bands are straight not curved as in agate/Brazil, Germany, India, Madagascar, Mexico.
Opal	5.5-6.5	October	A hydrous silica occurring in many different colours with a beautiful internal opalescence/many varieties, fire opal, water opal, black opal/Australia, Mexico, Hungary.
Pearl		June	An organic substance, the hardened secretions of certain varieties of shelled molluscs, chiefly oysters. The inner surface of the shells of these oysters yield *mother of pearl*/Pacific and Indian Oceans.
Peridot	6.0-7.0	August	A variety of olivine/clear green/Australia, Brazil, Burma, Norway.
Rock Crystal	7.0	April (alternative to diamond)	A variety of quartz/colourless/Brazil, Burma, France, Madagascar, Switzerland.
Ruby	9.0	July	A transparent variety of crystalline corundum with reddening trace of chromic oxide/dark red/Brazil, Burma, Thailand, Sri Lanka.
Sapphire	9.0	September	A corundum with bluish trace of iron or titanium/dark blue/Austria, Burma, Sri Lanka, Kashmir.
Sardonyx	6.5-7.0	August (alternative to peridot)	A reddish brown and white banded agate/Brazil, India, Germany, Madagascar.
Topaz	8.0	November	A silicate and flouride of aluminium/yellow, pink, blue/Australia, Brazil, Sri Lanka, Germany.
Tourmaline	7.0-7.25		A complex boro-silicate/deep green, bluish green, deep red/Brazil, Sri Lanka, Siberia (U.S.S.R.)
Turquoise	5.5-6.0	December	Formerly called Turkey stone, a phosphate of aluminium with traces of copper and iron/blue, greenish blue/Sinai Peninsula (Egypt), Iran, Turkey, U.S.A.
Zircon	7.0-7.5		A silicate of zirconium/colourless or white zircon makes brilliant stones when cut and polished. Coloured varieties range from brown to green, blue, red and golden yellow/Burma, Sri Lanka, India, North America, Thailand, Siberia (U.S.S.R.).

70. COAL

Energy fuels or fuels that provide heat energy have assumed vast importance since the Oil & Petroleum Exporting Countries (OPEC) have chosen to increase the price of oil to prohibitive levels. The dominating energy fuels in world economy are three; coal, oil and firewood. Apart from the fact that they are all organic substances and that they are burnt to provide energy, there is very little in common between them. They are quite different in form, occur in widely varying environments and are the products of entirely different processes.

Coal is derived from vegetable matter. When trees and other vegetation fall into swamps, and are covered over with soil, they undergo partial decomposition and become *peat*. In peat, the original woody material is generally visible. As more and more peat accumulates, bacteria break up the organic compounds present in it, liberate gases and convert it into *lignite* (brown coal). As more and more gaseous constituents are eliminated, by pressure of sediments deposited on the coal bed; or by pressure from earth movements, the

Box 26

PRECIOUS CORALS

Among the hundreds of Coral species that inhabit the Earth's warmer waters only a few varieties are highly prized for jewellery because of their beauty, hardness or lustre. Like many gems, Coral is almost imperishable. Such types include red, pink, gold, black and bamboo varieties. Precious Corals, like other Corals, are found in many shapes. Some grow into bushes with regular stems and branches, others grow like bamboos or spiral out as wires. Black Coral is often found as wiry growths. The skeletons of all these Corals are formed out of the first secretions of the coral larvae. Once the skeleton is formed, the larvae cling to it in their millions. They form a thin shining layer of living cells covering the skeleton much as bark covers a tree. The skeleton is of the same colour as that of the polyps—red, pink, gold or black as the case may be. If these skeletons are carefully washed, the living polyps fall off leaving the hard shiny core which forms the precious coral.

Precious coral is one of man's earliest discoveries. It is believed that the Neolithic men collected coral by diving into the Mediterranean. The Mediterranean coral, a vivid red, occurs at depths ranging from 30 to 900 feet. The same red variety is found in the Hawaiian waters only below 300 feet. Black coral occurs only between 100 and 350 feet. The more exotic pink, gold and bamboo varieties start at 1150 feet and go down to 1600 feet. Corals grow very slowly. Black precious corals grow at the rate of 2½ inches per year, while pink corals show an annual growth of about one-third of an inch. The total life span of precious corals is about 70 years. The latest and also the strangest discovery is that some varieties of precious corals shed their own light. The bamboo coral, for example, glows in sea depths where no sunlight penetrates.

Precious corals, unlike reef corals, do not require sunlight at all. In fact, they are found to be averse to it. The reef corals thrive in sunlight because they possess algae that photosynthesise light and provide the corals with extra nutrients. The precious corals do not contain this symbiotic algae and have to depend upon drifting larvae and floating detritus for their sustenance. This is incidentally one reason why they choose the dark unfathomed caves of ocean for their habitat.

In Hawaii, precious corals are big business with a turnover of over 500 million dollars.

Source: National Geographic Magazine, July 1978 & May 1979.

lignite is converted into various grades of coal.

High grades of coal have a heating value of some 7000 kilocalories or 12,600 British Thermal Units (BTU) per pound. Lower grades have only half or a third as much heating value. Coal is classified in two ways: (i) hard coal (anthracite and various grades of bituminous coal) and soft coal (brown coal and lignite), (ii) coking coal and non-coking coal. Coking coal has a metallurgical use (making steel) while non-coking coal has thermal uses, that is, when it is heated to provide either heat or steam for the generation of electricity. The ability of different types of coal to form coke (when they are heated in the absence of air) also varies greatly. So what matters is the type of coal mined, not the quantity.

The total world production of all types of coal in 1977 was 3400 million metric tons of which hard coal represented 2500 metric tons or about 70 per cent. More than 75 per cent of the world's output of hard coal is mined by six countries—USA, USSR, China, Poland, Britain and West Germany. Among the developing countries the only large producer is India. World production of brown coal had been increasing slowly reaching 950 million metric tons in 1977. East Germany is the largest producer with 250 million metric tons, followed by USSR with 180 million tons. Among the non-communist countries West Germany is the largest producer of brown coal. Because of its lower energy content brown (soft) coal contributed only 4 per cent of the world's total primary energy in 1977 as against 28 per cent contributed by hard coal.

Production Trends. Hard coal production in 1977 was about 23 per cent higher than in 1960. Much of the increase came from communist countries. In non-communist countries production remained practically stagnant from 1960 to 1978—ranging between 1.1 billion and 1.2 billion metric tons.

Major producers of hard coal between 1960 and 1978 were: (i) USA—400 million metric tons (1960) and 600 mmt (1977), (ii) UK—200 mmt (1960) and 125 mmt (1977), (iii) USSR—375 mmt (1960) and 500 mmt (1977), (iv) China—420 and 480, (v) Poland—106 and 180. Among developing countries, India alone showed a sizable production of hard coal with around 50 mmt in 1960 and 100 mmt in 1977.

Consumption Pattern. The pattern of consumption also varied. As in 1976, North America used the major portion of its coal (77 per cent) for the generation of electricity. Iron and steel consumed 10 per cent, other industries 11 per cent and residential and commercial consumption 2 per cent. In the same year, the proportions in Western Europe were, electricity generation 57 per cent, iron and steel 20 per cent, other industries 9 per cent and residential and commercial consumption 14 per cent. In Japan, the pattern was as follows: iron and steel 66 per cent, electricity generation 18 per cent, residential and commercial uses 11 per cent and other industries 5 per cent. In all other non-communist countries put together the pattern varied slightly with electricity generation accounting for 36 per cent, other industries 33 per cent, iron and steel 16 per cent, residential and commercial uses 3 per cent and railroads 7 per cent

Coal Reserves. The world's reserves of coal far exceed those of any other fossil fuel. In 1976 they were estimated at about 11500 billion metric tons of all grades out of which 1300 billion were known or measured reserves. Out of these reserves, 740 billion tons were deemed to be economically recoverable. Five regions hold 96 per cent of the known reserves, North America 31 per cent, USSR and Eastern Europe 26 per cent, Western Europe 17 per cent, China 15 per cent, and Australia 6 per cent. The 740 billion metric tons of recoverable coal includes coal of all grades When adjusted, the recoverable coal comes to about 600 billion tons of hard coal equivalent, which is enough to last 200 years at the present consumption rate. Compared to oil, 600 billion tons of hard coal is equivalent to 3000 billion barrles of crude oil which is four to five times the current estimated reserves of crude oil.

Substitute for Oil. The vast reserves of coal make it a competitive alternative to oil for energy purposes. Coal powered the industrial revolution and had been the main industrial and domestic fuel for more than a century. This has enabled us to develop sophisticated technologies for utilisation of coal. Coal like oil has many by-products—pitch, coal gas, tar and synthetic fuels. Despite all these advantages, a direct switch over to coal as a substitute for oil is not feasible. But a slow changeover is possible. Such a change has now become imperative in view of the ever-increasing oil prices which OPEC is demanding.

Difficulties of increasing coal production lie mainly in mining and transport. There are two types of mining, surface mining and underground mining. Surface mining is not only cheaper but safer. But most surface mines have been worked out or are being worked. There may be (in fact there are) virgin areas where surface mining is possible. But any sizable increase in coal production will have to come from underground mining, not from surface mining. This would not be so difficult if the governments concerned put their minds to it. President Carter had already set the trend with his scheme of expanded coal utilisation aimed at producing 1.2 million short tons a year by 1985.

Source: Scientific American Jan. 1979.

71. OIL

Oil and natural gas are very often found together. They are like coal, derived from the decomposition of small marine plants and animals. Bacteria play an important role in their formation. Natural crude oil, when refined by distillation, yields several varieties of oil, petrol, kerosene, lubricating oil, paraffin wax, asphalt etc. These products are useful in synthesising a number of organic chemicals like dyes, plastics, artificial rubber, fertilisers etc. This has opened up a vast new avenue of industrial products, generally referred to as *petrochemicals*.

It is a popular misconception that oil is found in vast underground pools, which can be pumped dry. Actually it is found in small spaces in porous rock somewhat like water in a sponge. It seeps slowly through the porous material until it is trapped by impervious (non-porous) rock, often as a layer between water and gas. The oil is usually under pressure. Boring or opening a well releases that pressure. The oil flows into the well where it either rises to the surface if the presure in the field is sufficient or is pumped out. Oil recovered under natural pressure is considered *primary production*. About 25% of the present US production belongs to this category. What is called *secondary production* occurs when water or gas is pumped into the reservoir to increase the pressure on the oil. A third method is to reduce the viscosity of the oil, so that it flows more easily, by heating the oil (by injecting steam) or injecting other chemicals to reduce viscosity. The second and third methods are being increasingly used since the 1940's, especially in USA. In the forties US production by these methods came to about only 25 per cent whereas in the seventies it increased to around 32 per cent.

The major factors that determine potential oil supply are two: (i) the amount of proven reserves, that is oil which can be economically recovered under the current technology and (ii) the rate at which these reserves can be exploited. Each field has a potential production rate that depends on the size of the field, its geology and its installed facilities. In general, it is not possible to produce more than 10 per cent of the recoverable reserves in any one year without prejudicing future production. Of course, a 10 to 1 ratio (of reserve to production) is an average estimate. It may be higher in some fields and lower in others. This average, like all averages, is likely to misguide, if adopted as a rule of practical application. A safer ratio would be 15 to 1, that is, producing 1/15 of the proven reserves every year.

Oil Reserves. Estimates of proven recoverable reserves of oil change from year to year. As the oil is being pumped out, the oil wells are being replenished by seepage from all over the field. So every year fresh estimates have to be made. Two factors that affect future production are the discovery of new oil fields and improvements in technology which enable higher recoveries to be made. Neither of these is predictable. They always remain uncertain making it impossible to forecast the course of future production.

According to the *Oil and Gas Journal*, proven reserves of oil existing in 1975 were 658 billion barrels. As against this reserve, the total production till 1975 was 341 billion barrels as follows:

Table 55

Country and/or Region	*Proven Reserves in 1975*	*Total Output till 1975*
	(In billion barrels)	
Saudi Arabia	152	23
Other OPEC—Middle East.	208	61
OPEC-Non—Middle East.	90	55
North America	40	133
Other Non-OPE Countries	65	19
Communist Countries	103	50
Total	658	341

The OPE countries (Arabia, other OPEC in Middle East and OPEC outside Middle East) among them held 450 billion barrels remaining as reserves in 1975 while their total output till 1975 came only to 139 billion. North America, on the other hand, had exhausted most of its original reserves by 1975 leaving a reserve balance of only 40 billion barrels. This has raised the OPEC to a highly advantageous supply position, giving them a stranglehold on other countries in oil supply.

Progress of Discoveries. During the last century some 30,000 fields of different capacities were discovered. Of these, only 240 promised a production potential of 500 million or more barrels. Of the total reserves, these 240 contained 73 per cent. Of these, only 15 fields had a reserve capacity of more than 10 billion barrels. They accounted for 34 per cent of the total production. But even among the 15, the largest four contained 21 per cent of the total reserves. Among the four largest fields only one is outside the Middle East—in Venezuela. The other three are in the Middle East.

The Middle East came into the picture late. By 1930 all the fields discovered were outside the Middle East. They totalled a production capacity of around 5 billion barrels a year. The first discoveries in the Middle East came in 1930-40. These increased the total production to 20 billion out of which 15 billion came from the Middle East. In 1940-50 the Middle East improved its position pushing up the production capacity to 25 billion barrels. After 1950, new discoveries continued to be made in the Middle East but by 1960-70 the leadership in discoveries had passed outside the Middle East. By 1975, however, the production rate had slowed down to around 15 billion barrels a year.

The production capacities mentioned above are those of the new wells discovered in the course of the decade concerned. They do not show the production of old wells. If the production of olds wells is also added, the picture changes totally. Thus while production in new wells (for the decade 1960-70) came only to 15 billion barrels (a year) the production of old and new wells put together raised the total to 55 billion barrels in 1970

National Policies. A new factor in oil production has emerged in the seventies. This is the oil policy of the big exporters who form the OPEC. These countries have adopted a general line of policy to control production in such a way as to make the available reserves last longer. This policy is likely to have a longstanding impact on production and therefore on supply. Take the OPE countries of the Arabian Peninsula (Saudi Arabia, Kuwait, Qatar and UAE). They control 58 per cent of the total OPEC proven resources. At a 15 to 1 rate of production (see supra) these countries together can produce 17.4 billion barrels a year or 47 million barrels a day, which is about equal to the total production of the non-communist countries. They have installations enough to produce oil at the rate of 16.8 million barrels a day. Yet in 1975, they actually produced much below their daily potential—11.3 million barrels a day, that is 5.5 million below their capacity. In view of their announced policies, there is every likelihood of their pegging production at 12.8 million barrels a day in future. Similarly, the OPE countries outside the Arabian Peninsula may also cut their production below their usable capacity of 20.2 million barrels a day. Three of these countries have already reduced their production, bringing down the total production to 19.4 million barrels a day.

Future Supply. The future of oil supply is extremely uncertain. But there are possibilities of many new discoveries, although discoveries of a gigantic size, like the biggest four of today, appear to be a dream. But the evolution of better technologies appears to be more than probable—almost certain. Such is the tempo of technological progress. Any improvement which enables a 1% rise in recovery rate will raise the oil production by about 1/30 of the reserves, which on the strength of the existing reserves will add 25 billion barrels a year to production.

Taking all these factors into account, we may count on increased oil production in the immediate future. But even assuming that the OPEC will put out their best and will produce 45 million barrels per day, the total world production may be between 75 and 80 million barrels. Even this supply will not be able to meet the demand of crude oil for the year 2000 on the present projections

The growth of oil production may keep on for another 15 years on the assumption that new fields will be discovered and improved techniques of recovery will be applied. After about 15 years we may envisage another period of ten years or so of fairly constant production. This will give time for governments and consumers to adjust themselves to a depleting oil supply and turn to alternate sources of energy.

Source: Scientific American.

72. FIREWOOD

Firewood is the third most important source of energy in the world. Wood as a primary source of energy has one great advantage over coal and oil. It is a renewable source. Coal and oil, on the other hand, cannot be renewed—at least by human efforts. This does not mean that the formation of coal and oil has ceased for all time. Actually coal and oil are still being stocked up naturally. But the annual rate of accretion is infinitesmal and in any case it takes millions of years for Nature to complete the process. Wood supply, however, can be replenished by human efforts. Wood is formed mostly in the forests. Forests will regenerate naturally or they can be regenerated by timely 'afforestation'. And it could be done in as short a period as a decade. The problem of wood is therefore the problem of conserving and expanding forests.

Forests. The land area of the world amounts to some 13.3 billion hectares or 32.8 billion acres. About a third of this area, say 4.1 billion hectares, is classified by the Food & Agriculture Organisation (FAO) as forestland. Most of the major regions of the world except for Asia and the Pacific have at last a fourth of the land under forests. In North & South Americas and the USSR the total is more than a third. In the US 305 million hectares (a third of the land area) is classified as forest. Around 202 million hectares of this forestland can be described as commercial timberland, that is, land capable of growing 1.4 cubic metres of timber per hectare or 20 cubic feet per acre.

Nearly half of the timber felled all over the world is consumed as fuel. The latest estimates show that out of a total wood harvest of 2 billion cubic metres per year, 990 million go for fuel. The rest is used in industry. So on a global basis the position is satisfactory. But the situation is altogether different when we compare developed and undeveloped countries. The developed countries, as a whole, have plenty of forestland and their consumption of wood for cooking and similar purposes is minimal. Thus in USA 98% of the wood produced is used up in industry. Only about 2% is consumed as firewood. On the other hand with more than 80% of the population dependent entirely on firewood India has only 23% of its land under forest. Even this small percentage is progressively rendered smaller by encroachments of all kinds for cultivation, habitation, grazing etc. Zafar Futehally, one of the leading conservationists of India, says, "The total consumption of wood in India is estimated to be 211 million cubic metres. For fuel alone 184 million cubic metres is used. The annual growth of timber is not more than 50 million cubic metres, which means that consumption is 4 times as much as production". The problem in all developing countries is more or less the same

Energy Potential. Forests have considerable energy potential. For example, if the energy value of wood is taken as 7500 BTU† per pound, the annual net primary production of the world's forests would roughly be 1200 quads (quadrillion) BTU. This is 5 times the total energy used up in the world in 1975, that is, 230 quads BTU. Taking the annual yield from forests to be 13 million metric tons of which half is economically accessible it has been estimated that forest wood can produce one million megawatts of electricity, which is about twice the present generating capacity of the US.

The situation in India is much the same. According to Murad Ali Baig, "...in terms of energy 211 million cubic metres of wood drawn from forests per annum, represent 50% more energy than the annual raisings of coal and over twice as much energy as is available from all electric power installations..."

The use of wood as fuel, though quite commonplace, does not yield to statistical verification since most of the gathering and burning of wood takes place outside the usual commercial channels We are therefore left to rely on estimates. Two scientists J.E.M. Arnold of the FAO and Jules Jongma, a Duch forest-scientist, have estimated the annual use of wood for fuel at 1.2 billion cubic metres in the developing countries and 150 million in the developed countries. According to them wood fuels account for two-thirds of all the energy (other than animal and human energy) used in Africa, for nearly a third in Asia, for one-fifth in Latin America and for a little over 1/20 in the Near East. In comparison, wood energy used in the developed countries works out at 0.3 per cent. In the developing countries the major obstacle to the substitution of other commercial fuels even in towns and cities "is quite simply that people are too poor to buy the necessary equipment for them"

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† British Thermal Unit

The pressure of supplies on fuel wood makes the crisis worse in several ways. People have to go longer distances to collect wood. They burn more animal dung and crop residues which could be employed more profitably in agriculture. "The diversion of dung from use in agriculture," say Arnold and Jongma, "is equivalent to burning food in order to cook food." The decline in agricultural output or shortage of land for agricultural use will prompt further encroachments on forest land, thus shrinking further the already critical availability of forestland. The extra human effort for gathering fuelwood from far off places will adversely affect the supply of agricultural labour also.

Since replacement of wood by other energy fuels like coal or oil is not possible for quite a long time, especially in the far flung reaches of the rural area, we have to resort to other measures. Just as the OPEC is trying to economise production of oil for as long as possible, the users of fuelwood have to economise consumption of fuel as far as possible. One obvious step in this direction is to reduce wastage by improvements in cooking arrangements. Another is to convert wood into charcoal which would then be less bulky and less costly for transport. This would also enable us to make use of the wood that is otherwise lost in land clearing and in logging operations. But the most constructive step that we can take is to open fuel wood plantations like the casurina plantations in the suburbs of Madras and thus beard the lion in his own den

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Source: **Scientific American, February 1979.**

73. RENEWABLE SOURCES OF ENERGY

Renewable sources of energy, include all those sources which are being replenished as they are being used up. In other words, they represent sources of energy, that will not run out like coal or oil. The quantity of coal or oil available for use is limited to the existing resources. When they are exhausted, these sources will be closed for ever (See Ss. 70 Coal & 71 Oil)

Thinking men in every country have been alive to this danger and the dire possibility of having to close down all productive enterprises, owing to a shortage of energy sources like coal or oil. When the environmentalists joined the fray to point out that coal and oil pollute not only the atmosphere but even the oceans and waterways, the necessity of looking for sources of power other than coal and oil was brought home to the world at large. The obvious alternative was the sun, the ultimate source of all energy in the biosphere (see S. 36 *Biosphere*). Investigations were therefore set afoot to harness solar energy. At the same time, other existing sources of energy were also examined with a view to convert them as permanent renewable source of power

When the Organisation of Petroleum Exporting Countries (OPEC) raised the price of oil four-fold in 1973, such investigations became imperative. The cost of energy is a substantial item in the cost of production. In some cases like aluminium or steel it may go as high as 50% of the total cost. In the cirumstances, the industrialised countries were perforce driven to look for other sources of power and to exploit them as soon and as much as possible

Forests. One such source was already in existence and was being exploited.

Forests naturally regenerate themselves or can easily be generated by human efforts and that in as short a period as a decade or two (see S. 72 *Firewood*). Forests are the natural homes of wood and wood has been a provider of energy from time immemorial.

The advanced countries who possessed forest land in plenty, lost little time in switching over to wood as an alternative source of energy. In the last decade (1973-83) wood has displaced nuclear power in the U.S. providing 2.6% of the country's total energy compared to 1.2% of nuclear power. By 1981 around 10% of all U.S. households were burning wood either as a primary or a secondary source of energy. In heavily wooded States nearly one-fifth of the homes use wood as a primary source of energy. American industry is also turning over to wood in increasing measure. By 1979 in New England alone, 150 industries had changed over to wood. Canada is following the same policy. Developing countries like Brazil and Philippines are also taking up to wood power more and more

Forest products are being put to new uses to lighten the energy burden. One of them is making compost heaps to provide energy. Composts are traditionally made for organic manure. The technique is now used to yield energy also in countries like France, which depend precariously on oil imports. Compost heaps for this purpose are made from brushwood, that is, tough bushes that form the undergrowth in forests. This undergrowth is not otherwise useful. As compost, the tough wood will be shredded up into small bits and heaped, so as to make it ferment.

A compost mound 3 metres high and 6 metres across will yield methane and hot water during fermentation. The fermentation may last for about one and a half years. During this period, an average family can meet all its requirements of energy—hot water, internal heating, cooking gas and motor fuel. Once fermentation ends, about 50 tons of organic manure will be formed. It is estimated that 1000 hectares of forest can supply 6000 tons of fertilisers every year, 960,000 cubic metres of biogas (equal to 480,000 litres of oil) and millions of litres of hot water at 4 litres a minute. Once cropped, the undergrowth will grow back in about seven years, when the process can be repeated

Hydel Power. Falling or flowing water is another renewable source of power. It had been used as such from as far back as 85 B.C. However, it is only in recent times, that the technique of producing electricity out of waterfalls was developed. The first hydel plant was put up in 1882 in Appleton, Wisconsin. The U.S. followed up this pioneering attempt to become the leading country in the world for hydro power generation. It is today producing 71,000 megawatts per year. U.S.S.R. with 47,000 megawatts comes second and Canada with 40,000 third. The developing countries are also resorting to hydel power in a big way—Kariba Dam, Zimbabwe (1,300 megawatts), Aswan High Dam, Egypt (2,100 m.w.), Furnas Project, Brazil (4,000 m.w.), Guri Project, Venezuela (29,000 m.w.) etc. India is keeping up with advanced countries in this regard. In 1981 she had 56 projects with a total capacity of 10,169.5 m.w. under different stages of construction.

Hydel Potential. It is estimated that on a global basis, four times the present installed capacity can be generated, if individual countries pay more attention. In a few countries like Japan or Switzerland almost all workable hydel projects have been taken in hand. But China with 2 big rivers, the Hwango (Yellow River) and Chang Jiang (the Yangtze) can increase its present capacity of 14,000 m.w. to 32,000 m.w. if the necessary capital is invested. Even the U.S. and Canada have sizable hydro potential resources which remain unutilised. In U.S.A. the simple expedient of providing power generating facilities on dams, which do not have them at present (such dams numbered 50,000 in 1977) and the simpler method of increasing the output of the existing hydel plants to its full capacity, will add substantially to its hydro-electric power.

Small scale hydel projects are feasible almost everywhere. France has taken the initiative in this matter by identifying some 90,000 sites, for small scale hydro projects. In the U.S. too, land owners are planning to put up small plants for hydel power as a commercial investment. As Lester R Brown says "By some reckonings, small dams—whether in China, the U.S. or France (or India, we may add) are the oil wells of the future."*

Wood and hydro-electric power are now the leading sources of renewable energy, and rank third and fourth in the global budget—that is, after coal and oil. Nevertheless, the total power derived from renewable sources today, is estimated to be the equivalent of 1.81 billion tons of coal or only about 16% of the total energy available. It is clear that renewable sources should be made to deliver at least double the present power capacity, if the industrialised countries are to find any relief from the present crisis.

Solar Power can be utilised directly or indirectly—directly for heating or similar purpose and indirectly as a generator of electricity. Solar heater is a simple device by which we can use the sun's rays directly for heating. It consists of a glass-topped box with a dark bottom which absorbs the incoming sunlight. The glass permits light to stream in unimpeded but traps the heat without allowing it to escape; just as in a green house. Once the heat is trapped it can be used to heat water or the interior of the house. With slight alterations in the mechanism, the solar heater can be used to cook food or distil water.

A slightly more complex variation of this technology is the vacuum tube collector. This is a glass tube an inch or so in diameter and containing water or some other heat absorbing liquid, which is put inside a larger glass tube. The space between the two tubes is a partial vacuum and serves as an insulator. These glass tubes attached to roof tops can supply the energy requirements of a household without its having to depend on community grids which supply electricity or natural gas.

Israel is the only country in the world that has put this technique into use on a national scale. Today roughly 10% of all the Israeli households rely entirely on solar power. It is expected that by 1990 solar heating units will increase from 400,000 to 650,000. All public buildings are by law compelled to incorporate solar heating systems.

In the U.S., interest in solar heaters increased after the oil price hike in 1973. Although sales of solar heaters in 1974 totalled only 1.3 million sq. feet of collectors, it is estimated to go up to 19 million sq. feet by 1980, bringing the total area of collectors up to 67 million sq. feet or one sq. foot for every three people in the U.S.

In France which imports all of its oil and most of its coal, interest in solar heaters runs high. In 1979 there were only 20,000 solar heaters functioning in France. It is planned to increase it to half a million by 1985.

In Asia, the only country that has caught on is Japan. In 1980 over 1.6 million buildings in Japan were using solar heaters. It is planned to increase this number to 7.8 million by 1990 and 12 million by 1995. This means that by 1995, 30% of all buildings in Japan will be fitted with roof top collectors.

Solar Electricity. Electricity can be generated from sunlight in two ways. One way is by concentrating sunlight on water to generate steam, which is then used to drive an electrical generator as in fossil — or nuclear-fired electrical generating plants. This technology, however, does not appear to be cost-effective and is unlikely to go beyond the pilot plant stage. The second method depends on the photovoltaic cell..

In 1954, scientists in New Jersey's Bell Laboratories discovered that a silicon wafer could generate an electrical current when struck by sunlight. When a light photon (See S. 2 *Photons*) hits an atom of silicon with enough impact to dislodge an electron, a diffuse form of electricity is generated. In the photovoltaic cell, the energy that dislodges the electron is funneled into a wire leading from the cell. The direct current (DC) generated in this way can then be converted either to alternating current (AC) or can be used more efficiently directly with DC-compatible appliances.

Photovoltaic cells are thin wafers of varying shapes and sizes. Single cells for use in pocket calculators are often less than one-half inch square. Cells can be linked together in arrays that are large enough to cover a rooftop.

"Despite the photovoltaic cell's latecomer status", says Lester Brown, "the feasibility of the technology for special uses is no longer questioned. By the mid-1960s, photovoltaic cells were being used to power communications satellites. At issue is whether the cost of photovoltaic-generated electricity, which is falling rapidly, will fall far enough to make it broadly competitive. Photovoltaic cells installed in the orbiting Skylab launched in 1973 cost $300 per peak-watt. In 1976 a small-scale purchase of the cells by a railway cost $45 per peak-watt of power. In 1978, one large government purchase was made at $11 per peak-watt, another at $7 per peak-watt. The Department of Energy projects that the price will fall to $2 per peak-watt by 1982, to 50 cents by 1986, and to 10 to 30 cents in the 1990s."

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* *Renewable Sources of Energy.*

The world's first solar-electric village is Schuchuli, one of fifty-three villages on the Papago Indian Reservation in Arizona (US). It was electrified for the first time in Dec. 1978 when its photovoltaic array was turned on. When the switch was thrown in this remote, sun-drenched community of only ninety-six inhabitants, it illuminated flourescent lamps that replaced kerosene lamps and started a small water pump that replaced a diesel-powered pump. The photovoltaic panels in Schuchuli now produce 3.5 kilowatts of peak-watt power — enough for forty-seven fluorescent lights; a two-horsepower water pump, fifteen small refrigerators, a sewing machine, and a communal washing machine. Excess power is stored in batteries for use at night and on cloudy days.

The world's second solar-electric village is in Upper Volta in Western Africa. There, the U.S. Agency for International Development has sponsored a 1.8 kilowatt photovoltaic generating array, which produces power that villagers use to pump water and grind grain. The water pump lifts 1,320 gallons per day, the most the well can supply, while the gristmill produces enough finely ground grain to meet the requirements of about 640 families. In this village of 2,700 where farming and cattle raising are the main activities, the new power source is particularly appreciated by the women, who have traditionally spent long hours drawing water and grinding grain by hand.

Capital Costs. In December 1980 the construction of EURELIOS, the world's first helioelectric power plant, was completed. It went on line at the beginning of 1981, feeding solar electricity into the grid of the Italian Electricity Board (ENEL) at Adrano, Sicily.

The plant design is based on the central receiver principle. Suntracking mirrors (heliostats) reflect direct solar radiation into a central receiver which is suspended above the field. Water is passed through the receiver in which it is converted into steam to drive a turbine coupled to a generator. The electric energy generated is fed into the existing grid.

This way of generating electricity, using the sun as the primary energy source, is one of the two main techniques. The other is photovoltaic conversion, in which the solar rays are directly converted into electricity via charge separation in a semiconductor. Both technologies are today at about the same investment cost level. Cost reductions are in prospect for both technologies, but only construction and operation of actual power plants will allow evaluation of the real energy costs of these technologies.

Winds. Winds release enormous amounts of energy. This was realised from very ancient times, and men have tried by various methods to harness this energy. Wind powered waterlifts were in operation in Persia, as far back as 600 B.C. Sailing ships relying entirely on wind power have crossed the high seas to discover new worlds. Much of the economically harnessable wind energy is concentrated along coastlines and in mountain passes. The U.S., Sweden and Denmark are the leading users of wind power in the world. Sweden and Denmark are poor in fossil fuels — coal and oil — and have to depend greatly on imported oil. With public opinion strongly against nuclear power plants, Denmark has paid special attention to harnessing wind power. Several small scale wind generators have been built and connected to the national electricity grid. Sweden endowed with belt of strong westerly winds have worked out a plan for the construction of some 3,300 large wind generators, with the potential capacity of 7 large nuclear reactors.

The U.S., which leads other countries in the matter has spent around 200 million dollars between 1973 and 1980 for developing wind generators. It is planned to produce small generators, suitable for homes as well as big turbines which can provide electricity to 2500 average American houses.

The promising coastal sites for wind generators are the northern coast of the

U.K., the southern and western coasts of Australia, U.S.S.R.'s Arctic coastline, and the undeveloped islands in the Caribbean, along the Trade Wind belts.

Garbage Energy. Organic waste can be converted into energy by various methods, the most promising of which are direct combustion and the conversion of such wastes into alcohol, methane or other storable fuels.

The idea is doubly advantageous, it will eliminate pollution, which is a big enough problem in all cities and provide power at the same time. The Germans had long been burning damp fuel such as lignite and this technology came in handy in burning garbage, which more often than not was wet or damp. So it turned out that when a survey of garbage burning plants was conducted in 1978 as much as three-fourths of the 262 plants were located in Europe. Most of the remainder was in Japan, the U.S. having only 6 such plants.

Munich, a model city from this perspective, derives 12 per cent of its electricity from garbage and other local wastes. Some of the world's largest refuse-burning plants lie on the outskirts of Paris, where each year they burn 1.7 million tons of the city's garbage in the production of steam. That steam, which both generates electricity and heats buildings, substitutes for an estimated 480,000 barrles of imported oil each year. Not far away, near Rotterdam, the world's largest single waste-burning facility burns more than a million tons of waste annually to fuel a 55-megawatt electrical generating plant. Wastes from many industries — wood waste from forest-based industries, bagasse from sugar industries and cheese, whey, citrus and vegetable wastes from food industries — have been found useful in producing fuel grade alcohol. It has been estimated that four-fifths of the garbage wastes in U.S. can be converted into 500 million gallons of ethanol per year or 0.5% of the gasolin consumption in U.S.

On the farm front livestock manure and crop residues, constitute a huge and self replenishing source of energy. New technologies have been evolved whereby farm wastes can be converted into energy, namely methane, a natural gas, and the residual waste can be used as fertilisers. This process of digesting livestock manure to produce methane, leaving a sludge that formed an excellent manure was first developed in China. In 1978 there were about 7 million methane digestors of this type operating in China. The Indian Bio-gas technique follows more or less the same pattern. The advantages resulting from such technologies are manifold — clear burning versatile methane, produced from local materials can conserve firewood, reduce the need for imported coal and kerosene, and upgrade various vegetable, human, and animal wastes into a high-quality fertilizer. In the process, more environmentally harmful fuels are displaced.

Geothermal Energy. Geo-thermal heat or heat generated in the bowels of the earth is being re-inforced by radio activity. The heat remains stored up in the interior of the earth, because there are no natural outlets for escape, except the volcanoes. This stock is gigantic and promises to be an inexhaustible source of energy. The richest geo-thermal resources lie along the so-called Ring of Fire that stretches from New Zealand up through New Guinea, the Philippines, Japan, Western Siberia and then down the western U.S., through Mexico, Central America and the west coast and south America (See S. 28 *Volcanoes*, and S. 27 *Seismic belts*).

Geo-thermal heat can be used directly for heating homes or for industrial purposes or indirectly to generate electricity. But since it is site-specific and cannot readily be transported except as electricity, industries relying on it, have to congregate around the world's major thermal fields, much as hydro-power is concentrated in areas having waterfalls.

Several countries already use geo-thermal heat for heating homes. Iceland depends on hot water drawn from underground to heat as much as 65% of all the homes. Similarly most of Iceland's fresh tomatoes, lettuces and cucumbers are produced in geo-thermally heated green houses. Two U.S. cities Klamath Falls (Oregon) and Boise (Idaho) rely on geo-thermal heat for internal heating. Hungary and Soviet Union have extensive acreages of geo-hermally heated green houses.

The Philippines has shown that even developing countries can exploit geo-thermal energy advantageously. The Philippines lit the first electric bulb based on geo-thermal energy in 1967

It has since brought on stream 440 m.w. of geo-thermal power at Tiwi. The Philippines plans to increase the existing capacity, 6 times in 7 years and thus save substantially on oil imports.

Exploitation of geo-thermal heat for industrial purposes is rather a new idea. One of the first industrial ventures of this type is the Tasman Pulp and Paper Company in New Zealand, which uses geo-thermal heat to operate its pulp and paper plant and timber drying kilns.

Production of geo-thermal electricity is still limited. However, the U.S., Italy, New Zealand, Japan and the Philippines have already started. Total capacity generated by these countries in 1979 was around 2000 m.w. By 1983 it is expected that around 3% of the electricity produced in the U.S. will be geo-thermal especially in California, Utah, Nevada, Hawaii and New Mexico. U.S.S.R. is planning a super geo-thermal plant, based on the Avashinski volcano on the Kamchatka peninsula, at a depth of 3.5 km (11,500 ft.) which will supply 5,000 m.w. geo-thermal power for 500 years.

Atomic Power. Initially much was made of atomic power as a renewable source of electricity, and a cheap substitute for other power resources. All industrialised countries went in for nuclear power. Among the developing countries, India took the lead by establishing a nuclear generator in 1969. But the fear of radiation and the more potent fear of opening the door to atomic war have acted as a drag on the development of atomic power all over the world. The U.S. which led every other country in developing atomic power, appears to have given up the attempt at expansion. In any case, Wall Street, has ceased to show any interest in atomic power as an industry. This is indicated by the fact that while the supply of atomic power remained stagnant at 1.2% of the total U.S. power, wood has increased its share to 2.6% by 1980.

As in 1980 the total nuclear power capacity stood at 136 GW (E)—Giga Watts (Electric)—or 136 billion watts of electricity. The increase over the previous year (1979) was 11%. This increase is accounted for by just 3 countries—France, Sweden and the Soviet Union.

Nuclear power is expected to account for 310 GW(E) or 11 per cent of the world's electricity-generating capacity, by 1985. The plants on which this estimate is based are either in operation already, or are under construction.

The annual report of the International Atomic Energy Agency (IAEA) for 1980 also points out that in the year under review there was no radiation-induced death and no serious radiation-induced injury in any nuclear power plant, or for that matter in any year since the first nuclear reactor went critical in 1956.

Box 27
Novel generator

HALIFAX (Canada): Canadian scientists are proposing to produce electricity from rivers by placing inverted windmills below the water surface. The swift current of water will turn the windmill and generate power. A model of this novel device is on display at the marine exhibition being held in connection with the World Oceanography Conference here. A prototype of this device has already been built by scientists of the National Research Council.—PTI.

The Hindu, Aug. 17, 1982

74. LANGUAGES

Number of Languages. No one has yet taken a satisfactory count of the world's languages. There are many estimates. They vary by thousands. The main cause of confusion is how to distinguish a language from a dialect. Linguists have not agreed as to what distinguishes a language from a dialect. In view of this the differing estimates are quite possible—and admissible. We have here adopted the estimate of [illegible] French and American linguists who have listed a total of 2796 languages.

Of the 2796 languages mentioned over 1200 are spoken by American Indian tribes, most of which do not number more than a thousand people. African-Negro groups speak some 700 different languages while the natives of Australia, New Guinea and other Pacific islands account for as many as 500 languages of their own. Add to this an estimated 200 minor languages of Asia of unknown origin and we find that the total number of the world's major languages (spoken by a million or more people) hardly exceeds 160; in other words, the overwhelming majority of the world's languages, say 85 per cent, are spoken by numerically small groups, while some 15 per cent represent major languages.

Language Families. The world's languages considered as families fall into 10 broad groups. 1. Indo-European, 2. Semito-Hamitic, 3. Sino-Tibetan, 4. Dravidian, 5. Ural-Altaic, 6. Malayo-Polynesian, 7. African-Negro, 8. American-Indian, 9. Caucasian, 10. Miscellaneous.

1. Indo-European Family†. The Indo-European languages may be subdivided into four major divisions.

(a) **Germanic** includes English, German, Dutch, Swedish, Danish, Norwegian, and Icelandic.

(b) **Romance** includes French, Spanish, Portuguese, Italian and Romanian.

(c) **Balto-Slavic** includes Russian, Polish, Ukrainian, Czech, Slovak, Serbo-Croatian and Bulgarian.

(d) **Indo-Iranian** group may be conveniently divided into *Iranian* and *Indic* or Indo-Aryan branches. *Sanskrit* of the Indic branch is the original Indo-Iranian language that was brought into India by the Aryan immigrants. It is the earliest of the Indo-European languages to appear in recorded form.

2. Semito-Hamitic Family comprises Arabic, Hebrew, Libyan, Berber, Galla, Amharic (Ethiopia) and Somali languages.

3. Sino-Tibetan Family is dominated by Chinese, which with its many dialects command 700 million speakers out of a total of about 760 million for the whole family. Tibetan, Burmese, Thai, Japanese and Korean languages form the rest of the family.

4. Dravidian Family includes the major languages of South India, Tamil, Telugu, Kannada and Malayalam.

5. Ural-Altaic Family includes Finnish, Hungarian, Turkish, Mongol and Manchu.

6. Malayo-Polynesian Family comprises Maori (native to New Zealand), Malagasy (Madagascar), Malay and Indonesian.

7. African-Negro group covers the major African languages, Sudanese, Guinean, Bantu, Hausa (Nigeria), Swahili and others.

8. American-Indian Family comprises many languages of the Red Indian tribes and includes the languages of the Eskimos and Aleuts.

9. Caucasian Family consists of a number of small languages like Georgian and Circuosian.

10. Miscellaneous. Among the lesser families, the *Austric family* apparently commanded a wide circulation in very ancient times. It is at present represented by tribal tongues like the *Munda* group in India. The aboriginal languages of Australia, Tasmania and New Guinea apparently belong to this group.

Basque, which is spoken on both sides of the Pyrenees in Europe, appears to be a remnant of a language family called Mediterranean, which has long since disappeared. The present speakers of Basque number nearly a million.

Basque is a very difficult language. The story goes that the devil tried to learn Basque, so as to tempt and ruin the Basques but gave up the attempt in despair. Basque has no affinity to any European language but bears close resemblance to many American-Indian tongues. Some linguists believe that Basque was the language of the lost continent, Atlantis.

The *Ainu*, the language of the white-skinned people of Hokkondo, the northernmost of Japanese islands, the *Hyperborean* tongues of Siberia and Kamchatka and many other minor groups too numerous to mention make up the rest of the world's languages.

Great Modern Languages. Of the great modern languages, 13 are spoken by 50 million or more people. They are Chinese, English, Hindustani*, Russian, Spanish, German, Japanese, Arabic, Bengali*, Portuguese, Malay (Indonesian), French and Italian. Approximate estimates of speakers of different languages made by various authorities differ greatly, sometimes by millions. This is so because the speakers of different languages are spread over the whole globe and no statistics beyond so-called guestimates are available about them.

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† The term Indo-Hittite is now preferred to Indo-European. This will include Anatolian language and Indo-European proper.

* See India.

Chinese, the first language in point of speakers is mainly confined to China and Manchuria. *Japanese* is first and foremost the native tongue of the people in Japanese islands, but enjoys some currency in Korea and the nearby area of Asiatic mainland. *Malay* is spoken in Indonesia and Malaysia and is understood as far as the Philippines. *Arabic* covers an incredibly huge area from Africa right across Asia and is learned wherever Islam predominates, though it is almost everywhere mingled with other languages of non-Arabic stock like Berber, Cushite and Hebrew.

English covers nearly one-fifth of the earth's surface. It is spoken by 200 million people in the western hemisphere and includes over 60 million in Europe, some 25 million in Asia, about 5 million in Africa and more than 13 million in Oceania, comprising Australia and New Zealand. *Russian* dominates one-sixth of the total area of the earth, being the national language throughout the Soviet Union. But Russian is used as a native tongue only by half the population of Soviet Russia. The rest speak some 145 different languages. *Spanish* appears in its homeland Spain and the ex-Spanish colonies. But these account for only a quarter of the Spanish-speaking population. The rest (three-fourths) are in the western hemisphere, covering Mexico, Central America, Cuba, Puerto Rico, the Dominican Republic, and all South American countries barring Brazil and the Guineas. *Portuguese* is spoken in Portugal and the ex-Portuguese colonies. But the greatest number of Portuguese speakers is concentrated in Brazil

German is practically confined to Europe where it is spoken in Germany, Austria, and most of Switzerland. But it enjoys wide currency as a scholastic language all over Europe, especially in Czechoslovakia, Poland, the Netherlands, Hungary, Yugoslavia, Sweden and Norway, where it is spoken by an estimated 20 million people *French* is the language of France, part of Switzerland, Belgium, ex-French possessions or Departments overseas and Canada (especially the province of Quebec). It is reputed as a language of culture in Europe, and is spoken by some 5 million non-French men, in addition to their mother tongues. *Italian*, the language of Italy, is current in the former Italian colonies, Eritrea, Somaliland, Libya and Cyrenica and is used by Italiah emigrant groups numbering some 10 million, living in various Mediterranean countries, and USA rgentina, Brazil, Uruguay and Chi

Table 56

Major World Languages

Language	*No. of speakers (in million)*	*Principal Areas*
Chinese‡	700	China
English	300	UK, USA, CANADA, Ireland, Australia, New Zealand
Russian	200	USSR
Spanish	165	Spain, Latin America
Hindi	153	North India
Japanese	100	Japan
German	100	Germany, Austria, Switzerland
Bengali	95	India, Bangladesh
Portuguese	90	Portugal, Brazil
Arabic	90	Middle East, North Africa
French	75	France, Belgium, Canada, Switzerland
Italian	55	Italy
Indonesian	50	Indonesia
Javanese	45	Java (Indonesia)
Telugu	44	Andhra Pradesh (India)
Tamil	42	Tamil Nadu (India), Sri Lanka
Marathi	41	Maharashtra (India)
Urdu	40	India, Pakistan
Punjabi	40	India, Pakistan
Korean	40	Korea (North & South)
Ukrainian	37	Ukraine (USSR)
Vietnamese	35	Vietnam
Polish	32	Poland
Turkish	30	Turkey
Gujarati	25	Gujarat (India)
Thai	25	Thailand
Malayalam	22	Kerala (India)
Kannada	21	Karnataka (India)
Farsi (Persian)	20	Iran
Burmese	20	Burma
Oriya	19	Orissa (India)
Romanian	18	Romania
Serbo-Croatian	15	Yugoslavia
Hausa	15	Nigeria, Niger
Pushto	14	Afghanistan, Pakistan

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‡ Including (Mandarin-560; Cantonese 45, Wu-40, Min-35, Hokka-20)

Bhojpuri	14	Eastern India
Sudanese	13	Sudan
Hungarian	12	Hungary
Dutch	12	The Netherlands
Swahili	12	East Africa
Visayan	12	Philippines
Nepali	10	Nepal
Greek	10	Greece
Czch	9	Czechoslovakia
Assamese	8	Assam (India)
Swedish	8	Sweden
Bulgarian	8	Bulgaria
Belorussian	8	Belorussia (USSR)
Sinhalese	8	Sri Lanka
Amharic	8	Ethiopia
Yoruba	8	Nigeria
Madurese	8	Madura (Indonesia)
Ibo	8	Nigeria
Azerbaijani	7	Azerbaijan (USSR)
Sindhi	7	Pakistan, India
Catalan	6	Spain
Chattisgarhi	6	Bihar (India)
Magadhi	6	do
Maithali	6	do
Fulani	6	West Africa
Malagasy	6	Malagasy
Uzbek	6	Uzbekistan (USSR)
Malaya	6	Malaysia, Singapore
Chuang	6	China
Tagalog	6	Philippines
Quechua	6	Peru, Bolivia
Danish	5	Denmark
Flemish	5	Belgium
Provencal	5	France
Tartar	5	Tartar (USSR)
Kurdish	5	Turkey, Iraq, Iran, USSR
Khmer	5	Kampuchea
Ruanda	5	Ruanda, Congo
Galla	5	Ethiopia
Norwegian	4	Norway
Marwari	4	Rajasthan (India)
Finnish	4	Finland
Yiddish	4	USA, Israel
Slovak	4	Czechoslovakia
Armenian	4	Armenia (USSR)
Kazakh	4	Kazakhistan (USSR)
Tibetan	4	Tibet
Uighur	4	Sinkiang (China), USSR
Twi	4	Ghana
Malinke	4	West Africa
Sotho	4	Lesotho (Africa)
Zulu	4	South Africa
Xhosa	4	do
Lithuanian	3	Lithuania (USSR)
Georgian	3	Georgia (USSR)
Hebrew	3	Israel
Santali	3	Eastern India
Yi (Lolo)	3	China
Minangkabau	3	Sumatra (Indonesia)
Ilocano	3	Luzon (Philippines)
Somali	3	Somalia
Mossi	3	Upper Volta
Albanian	2.5	Albania
Mongolian	2.5	Mongolia (China)
Miao	2.5	China
Buginese	2.5	Celebes (Indonesia)
Kashmiri	2.5	Kashmir (India)
Rajasthani	2	Rajasthan (India)
Moldavian	2	Moldavia (USSR)
Lao	2	Laos
Achinese	2	Sumatra (Indonesia)
Balinese	2	Bali (Indonesia)
Bikol	2	Luzon (Philippines)
Ganda	2	Uganda
Nyanja	2	Malawi, Zambia
Mbunda	2	Angola
Makua	2	Mozambique
Afrikaans	2	South Africa
Mayan	2	Mexico, Guatemala
Guarani	2	Paraguay
Latvian	1.5	Latvia (USSR)
Slovenian	1.5	Yugoslavia
Mordvin	1.5	Mordavia (USSR)
Chuvash	1.5	Chuvash (USSR)
Tadzhik	1.5	Tadzhikistan (USSR)
Gondi	1.5	East India
Shan	1.5	Burma
Karen	1.5	Burma
Batak	1.5	Sumatra (Indonesia)
Sidamo	1.5	Ethiopia
Kikuyu	1.5	Kenya
Kongo	1.5	Congo
Luba	1.5	Congo
Bemba	1.5	Zambia
Bhili	1	Gujarat (India)
Welsh	1	Wales
Breton	1	Brittany (France)
Macedonian	1	Macedonia (Yugoslavia)
Estonian	1	Estonia (USSR)
Bashkir	1	Bashkir (USSR)
Turkmen	1	Turkmen (USSR)
Kirgiz	1	Kirgiz (USSR)
Baluchi	1	Pakistan, Iran
Dayak	1	Borneo (Indonesia)
Tulu	1	Karnataka (India)
Wolof	1	Senegal
Mende	1	Sierra Leone
Ewe	1	Ghana, Togo
Fon	1	Dahomey
Kanuri	1	West Africa
Fang	1	Gabon, Cameroon
Drinka	1	Sudan
Lingala	1	Congo
Mangbetu	1	Congo
Rundi	1	Burundi, Congo
Kamba	1	Kenya
Luo	1	Kenya
Sukuma	1	Tanzania
Tigrinya	1	Ethiopia
Shona	1	Zimbabwe
Tswana	1	Botswana, South Africa

75. CLASSICAL WRITERS

(Sanskrit, Greek & Latin)

A

Aeschylus (525-456 B.C.) Athenian dramatist. *Promotheus Bound, The Persians, The Seven against Thebes, Oresteia etc.*

Aesop (c. 620-560 BC) Greek fabulist. *Aesop's Fables.*

Amaruka (7th century AD) Sanskrit poet. *Amaruka Sataka* (100 stanzas of Amaruka).

Anacreon (c. 6th century B.C.) Famous Greek lyric poet.

Aquinas, St. Thomas (c. 1225-1274) Italian philosopher and theologian. *Summa Theologica, Summa Contra Gentiles.*

Aristophanes (c. 444-c. 385 B.C.) Athenian satirist and comic poet. *Lysistrata, Birds, Peace, Acharnians* etc.

Aristotle (384-322 B.C.) Greek philosopher. *Rhetorics, Politics, Natural History, Poetics.*

Asvaghosha (A.D. 1st cent.) Sanskrit poet. *Buddhacharita* (Story of Buddha).

B

Bana (A.D. 7th cent.) Sanskrit prose writer. *Harshacharita* (Story of Harsha). *Kadambari*, a romantic story.

Bhadrabahu (4th cent. B.C.) *Kalpasutra* (a manual on ceremonies).

Bharavi (A.D. 6th cent.) Sanskrit poet. *Kiratharjuneeya* (Arjuna and Kiratha).

Bhatti (A.D. 7th cent.) Sanskrit poet. *Bhattikavya* (Bhatti's poem), a story of Rama.

Bhartruhari (A.D. 7th cent.) Sanskrit poet. *Nitishataka* (100 stanzas on morals), *Shringarashataka* (100 stanzas on love), *Bhaktishataka* (100 stanzas on piety).

Bhasa (A.D. 5th cent.) A prolific Sanskrit writer. Wrote 13 plays. *Swapna Vasavadatta* (Vasavadatta's Vision), *Pratijna Yaugandharayana* (Vow of Yaugandharaya), *Charudatta.*

Bhavabhuti (A.D. 8th cent.) Sanskrit dramatist. *Malathimadhava* (story of Malathi and Madhava), *Mahaviracharita* (Story of the Great Hero), *Uttararamacharita* (Later deeds of Rama).

Bilhana (A.D. 12th cent.) Sanskrit poet. *Vikramankadevacharita* (Story of Vikramanka—Chalukyan emperor), *Chaurapanchasika* (Fifty stanzas on the thief).

D

Dandin (7th cent. A.D.) Sanskrit prose writer. *Dasakumara Charita* (Tales of the Ten Princes).

Diogenes (412-323 B.C.) Greek philosopher, founder of Cynic philosophy.

E

Epicurus* (342-270 B.C.) Greek philosopher, founder of the Epicurean School. *Letters to Herodotus, Menocecus and others, De rerum natura.*

Euripides (480-406 B.C.) Greek dramatist. *Alcestis, Bacchae.*

G

Gunadhya (?) 1st cent. A.D. Sanskrit writer. *Brahat Katha* (the great story), a collection of many stories.

H

Hala (Satavahana King) 1st cent. A.D. Sanskrit poet. *Saptasati* (Seven Hundred Verses).

Herodotus (c. 485-425 B.C.) Greek historian. *History of the Persian invasion of Greece.*

Homer (c. 700 B.C.) Greek epic poet. *Iliad, Odyssey.*

Horace (65-8 B.C.) Latin poet. *Satires, Epodes, Odes.*

J

Jayadeva (12th cent. A.D.) Sanskrit

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* Epicurean, today, means one who has fine tastes in eating and drinking. This is unfortunate, for Epicurus was a confirmed ascetic, who advocated intellectual pleasures and not the appeasement of physical appetites.

poet. *Gita Govinda* (Song of Govinda).

Jimutavahana (12th cent. A.D.) *Dayabhaga*, a treatise relating to Hindu inheritance—part of a great compilation, *Dharma Sutra*.

Juvenal (Decimus Junius . Juvenalis) (60-140). Latin poet. *Satires*.

K

Kalhana (12th cent. A.D.) Sanskrit writer. *Rajatharangini* (River of Kings—a story of the kings of Kashmir).

Kalidasa (5th cent. A.D.) The greatest Sanskrit poet. Plays: *Malavikagnimitra* (Malavika and Agnimitra—a comedy of harem intrigue). *Vikramorvasiyam* (Urvasi won by valour). *Abhijnana Sakunthalam* (Recognition of Sakunthala). Epics. *Raghu Vamsa* (Dynasty of Raghu). *Kumara Sambhavom* (Birth of the War god). Lyrics: *Meghdoot* (Cloud Messenger). *Ritu Samhara* (Garland of Seasons).

Kautilya (Chanakya) (4th cent. B.C.) was the Chief Minister of Chandragupta Maurya. A well-seasoned politician, he practised Machiavellian tactics many centuries before Machiavelli. The only work attributed to him is *Artha Sastra* (Science of Statecraft).

Kumaradasa (6th cent. A.D.) Sanskrit poet.*Janakiharana* (Abduction of Janaki).

M

Magha (7th cent. A.D.) Sanskrit poet. *Sisupala Vadhom* (Slaying of Sisupala).

Mahendra Vikraman (a Pallava King) Sanskrit poet. *Matta Vilasa* (Sport of Drunkard).

Manu (2000 B.C.) (legendary author) Sanskrit law-giver. *Manu Smrithi* (The Code of Manu).

N

Narayana (12th cent. A.D.) Sanskrit story teller. *Hitopadesa* (Salutary Advice)—selected stories from *Panchathanthra*.

Naya Chandra Suri (14th cent.) Sanskrit poet. *Hammira Mahakavya* (Epic of Hammira).

O

Ovid (Publius Ovidius Naso) (43 B.C.—16 A.D.) Latin poet. *Tristia, Amores, Persephone Rapta*.

P

Panini (4th cent. B.C.) Sanskrit grammarian. *Ashtadhyayi* (Book of Eight Chapters).

Patanjali (2nd cent. B.C.) Sanskrit grammarian. *Mahabhashyam* (commentary on Panini).

Plato (427-347 B.C.) Greek philosopher. *The Republic, Apology of Socrates, Phaedo, Laws*.

Pliny the Elder (23-79 A.D.) Latin philosopher. His *Natural History* is an encyclopaedia of all scientific knowledge available at the time.

Plutarch (c. A.D. 46-120) Latin biographer. *Lives*.

R

Rajasekhara (10th cent. A.D.) *Karpoora-Manjari*, a romantic drama.

S

Sandhyakara (12th cent. A.D.) Sanskrit poet. *Rama Charitha* (Story of Rama).

Sappho of Lesbos (early 6th cent. B.C.) Greek poetess of romance and amour. *Unrequited Love*.

Seneca, Lucius Annaeus (c. 4 B.C.—56 A.D.). Stoic philosopher, tutor of Nero. Sentenced to end his own life, he killed himself courageously.

Somadeva (11th cent. A.D.) Sanskrit poet. *Katha Sarit Sagara* (Ocean of Story)—collection of stories.

Sophocles (495-406 B.C.) Greek dramatist. *Antigone, Oedipus the King, Oedipus at Colonus*.

Subandhu (7th cent. A.D.) Sanskrit poet. *Vasavadatta*.

Sudraka (5th cent. A.D.) Sanskrit dramatist. *Mrichhakatika* (Clay cart).

T

Tacitus, Caius Cornelius (55-c. 120) Latin historian. *Germania, Annals, Histories*.

Thucydides (c. 460-399 B.C.) Greek historian of the *Peloponnesian War*.

V

Vakpati (8th cent. A.D.) Sanskrit poet. *Ganda Vadha* (Slaying of Ganda) describes the exploits of Yasovarma. King of Kanyakubja.

Valmiki (6th cent. B.C.) Sanskrit epic poet. *Ramayana*.

Vatsyayana (5th cent. A.D.) Sanskrit writer. *Kama Sutra* (Art of Sex).

Vidyapathi (Legendary author) Sanskrit prose writer. *Pancha Tantra* (Five Treatises)—a collection of tales.

Vijneswara (11th cent. A.D.) Sanskrit writer. *Mitakshara*, a treatise on the law of Hindu inheritance:

Virgil (Publius Vergilius Maro) (70-19 B.C.) Latin epic poet. *Aeneid*, *Georgics*.

Visakhadatta (6th cent. A.D.) Sanskrit dramatist. *Mudra Rakshasa* (Minister's Signet Ring). *Devi Chandragupta* (The Queen and Chandragupta)—political dramas.

Vyasa, (6th cent. B.C.) Sanskrit epic poet. *Mahabharata* is considered the longest epic in the world. It has nearly 100,000 stanzas.

X

Xenophon (444-359 B.C.) Greek soldier, historian and author. *Anabasis* (The Retreat of the Ten Thousand).

Z

Zeno of Citium (c. 340-264 B.C.) Greek philosopher, founder of the Stoic school. Zeno taught in *Stoa Poikile* of Athens, hence *Stoic*.

76. ABBREVIATIONS

Abbreviations are an accepted form of usage in all developed languages. They save time and space—time in talking and space in writing. It is for this reason that abbreviations have become popular with all and sundry.

Formerly abbreviations were used sparingly. Only well known organisations, products, processes, or projects were indicated by their initials. Today, abbreviations are being bandied about indiscriminately. They are being used for all sorts of things, well known, little known and unknown.

The abbreviations given below form two categories: 1. abbreviations derived from foreign languages, especially Latin and 2. abbreviations derived from initials which are now generally called acronyms.

I

Latin

AD (anno Domini)	in the year of our Lord (after Christ)
ADC (aide-de-camp)	helper or assistant
AH (anno Hegirae)	in the year of the Hegira (Mohammud's flight from Mecca to Medina, 622 AD)
a.m. (ante meridiem)	before noon
B.A. (baccalaureus artium)	Bachelor or Arts.
M.A. (magister artium)	Master of Arts
disco. (discotheque)	A place where one can dance to music played on records or discs.
DG (Dei gratia)	by the grace of God
D.V. (Deo volente)	God willing
e.g. (exempli gratia)	for example
et al. (et alibi, et alii)	and elsewhere/and others
etc. (et ceteri or et cetera)	and others/and so forth
et seq. (et sequens)	and what follows
ibid (ibidem)	the same
i.e. (id est)	that is
in cog. (in cognito)	unknown
infra dig. (infra dignitatum)	below status
i.q. (idem quod)	the same as
loc. cit. (loco citato)	at the place quoted
N.B. (nota bene)	note well
op. cit. (opero citato)	in the work cited
non seq. (non sequitur)	it does not follow
M (monsieur)	mister
Mme. (madam)	Mrs.
Mmes (mesdames)	plural of Mrs.
Mlle. (mademoiselle)	Miss
Mlles. (mesdemoiselles)	plural of Miss
Oxon (Oxoniensis)	of Oxford University
peccavi (see Box)	
per pro. (per procurationem)	by the agency of
per cent (per	

centum)	per hundred
p.m. (post meridiem)	afternoon
PS. (post scriptum)	written after
PPS. (post post scriptum)	additional postscript
q.v. (quod vide)	which see
RSVP (repondez s'il vous plait)	reply if you please
RIP (requiescat in pace)	rest in peace.

Box 28

Peccavi

"I have sinned", also "I have Sind"—a historic pun on the word "Sinned". Sir Charles Napier, the representative of the Br. Government in Sind, is reported to have used this expression to convey the news of his victory over the Amirs of Sind to the Governor General, Lord Ellenborough, on 4th April 1843. The conquest of Sind was the meanest act of aggression committed by the British in India. Sir Charles himself described it as "a very beneficent piece of rascality."

II

Acronyms

ABC	Audit Bureau of Circulation
ABM	Anti-Ballistic Missile
AC	Alternating Current (Electricity)
ACC	Auxiliary Cadet Corps.
A/c	Account
ADB	Asian Development Bank
AEC	Atomic Energy Commission, India
AICC	All India Congress Committee
AIMO	All India Manufacturers' Organisation
AIIMS	All India Institute of Medical Sciences
AINC	All India Newspaper Editors' Conference
AIR	All India Radio
AITUC	All India Trade Union Congress
AP	Andhra Pradesh
BARC	Bhabha Atomic Research Centre, India.
BBC	British Broadcasting Corporation
BC	Before Christ (cp. A.D.)
BCG	Bacillus Calmette Guerin (an anti-tuberculosis vaccine developed by two French doctors, Calmette & Guerin)
bhp	Brake Horse Power
BIS	British Information Service
BO	Body Odour
BOAC	British Overseas Airways Corporation
BP	Blood Pressure/Before Present*
BTU/ B.Th.U.	British Thermal Unit
C.A.	Chartered Accountant
CADA	Command Area Development Agency, India.
CARE	Co-operative for American Relief Everywhere†
CASA	Church's Auxiliary for Social Action, India
CBI	Central Bureau of Investigation, India
CCI	Cricket Club of India, Bombay/Cotton Corporation of India
cf	Confer/Refer
CIA	Central Intelligence Agency, USA
C-in-C	Commander-in-Chief
CID	Criminal Investigation Dept./ Central Investigation Dept.
c.i.f.	Cost, Insurance and Freight (a commercial term)
CITU	Centre of Trade Unions, India
CJ	Chief Justice
CO	Commanding Officer
Co.	Company
C/o	Care of
cp	Compare
CSIR	Council of Scienfic and Inustrial Research, India
CSO	Central Statistical Organisation, India/Congress of Industrial Organisations, USA
DA	Dearness Allowance
DC	Direct Current (cp. AC)/District of Columbia (as in Washington DC)
D & C	Dilation & Curettage (a minor uterine operation. A curette is a spoon-shaped instrument, with which the uterine wall is scraped.)
DDT	Dichloro diphenyl trichloroethane (an insecticide)
DGTD	Director General of Technical Development, India
DIG	Deputy Inspector General of Police
DLO/RLO	Dead Letter Office, now Returned Letter Office (RLO)

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* A system of chronology which avoids change over from A.D. to B.C. or vice versa.

† Originally E stood for *Europe*. Later when the services of CARE were extended beyond Europe, it was changed to *Everywhere*

DNA	Deoxyribonucleic Acid
DPI	Director of Public Instruction (Education)
DVC	Damodar Valley Corporation
ECG	Electro cardiogram
EEG	Electro encephalogram
EMG	Electro myogram (a record of nerve impulses to muscles and their responses)
E & OE	Errors and Omissions Excepted (commercial term, mostly used in bills)
ESI	Employees' State Insurance, India
ESP	Extra Sensory Perception
FACT	Fertilisers & Chemicals Travancore, Ltd.
FBI	Federal Bureau of Investigation, USA
FICCI	Federation of Indian Chambers of Commerce & Industry
FLS	Fellow of the Linnaean Society
FOB/R	Free on Board/Rail (commercial term)
FRS	Fellow of the Royal Society
GHQ	General Headquarters
GI	Government or General Issue, hence Common Soldier (USA)
GMT	Greenwich Mean Time
GNP	Gross National Product
GRT	Gross Rated Tonnage
HAL	Hindustan Aeronautics Ltd.
HMT	Hindustan Machine Tools
Hon	Honourable/Honarary
HQ	Headquarters
hr	Hour
HSD	High Speed Diesel
HSL	Hindustan Steel Ltd.
IAF	Indian Air Force
IARI	Indian Agricultural Research Institute, New Delhi (formerly Pusa Institute)
IAS	Indian Administrative Service
IBM	International Business Machines, USA/Indian Bureau of Mines
ICAR	Indian Council of Agricultural Research, New Delhi
ICBM	Inter-Continental Ballistic Missile
IDBI	Industrial Development Bank of India
ICMR	Indian Council of Medical Research
IENS	Indian & Eastern Newspapers Society
IG	Inspector General of Police
IIT	Indian Institute of Technology—at Delhi, Kanpur Bombay, Madras and Kharagpur
INS	Indian Naval Ship
INTUC	Indian National Trade Union Congress
IOC	Indian Oil Corporation
IOU	I Owe You (a simple form of acknowledging a debt)
IPC	Indian Penal Code
IQ	Intelligence Quotient
IRBM	Intermediate Range Ballistic Missile
ISI	Indian Standards Institution
IST	Indian Standard Time
IUCD	Intra-Uterine Contraceptive Device
JP	Justice of the Peace
KGB	Komitet Gosudarstvennoy Bizo pasnosti (Russian Secret Police, previous names GPU, OGPU, NKVD etc.)
KKK	Ku-Klux-Klan (a White Secret anti-Negro Terrorist Society, USA)
Lib	Liberation (women's lib) also *liber* (book)
LIC	Life Insurance Corporation of India
LSD	Lysergic Acid Diethylamide (a drug used as a stimulant)
MCC	Marylebone Cricket Club, Britain
MI	Military Intelligence, Britain (MI 5 & 6 are particular divisions)
MIRV	Multiple Independently Targeted Re-entry Vehicle (to hit several targets in different directions at the same time)
MISA	Maintenance of Internal Security Act, India
MIT	Massachusetts Institute of Technology, USA
MLA	Member of the Legislative Assembly (Lower House in States, India)
MLC	Member of the Legislative Council (Upper house in States, India)
MP	Member of Parliament
mph	Miles per hour
MRTPC	Monopolies and Restrictive Trade Practices Commission, India
MS/MSS	Manuscript/Manuscripts
mv	Motor Vessel/Merchant Vessel
NAFEN	Near and Far East News Agency
NASA	National Aeronautics and Space Administration Agency, USA
NCC	National Cadet Corps, India
NCO	Non-Commissioned Officer
NOC	No Objection Certificate

NP	Notary Public
N & Q	Notes and Queries
OAPEC	Organisation of Arab Petroleum Exporting Countries, Kuwait.
OED	Oxford English Dictionary or The New English Dictionary
OGL	Open General Licence (Imports)
OIL	Oil India Ltd.
OK	All Correct
ONGC	Oil & Natural Gas Commission
OPEC	Organisation of Petroleum Exporting Countries
PAA	Pan American Airways
PEN	Poets, Playwrights, Essayists, Editors and Novelists (An international club of writers)
perks	Perquisites of office
PIB	Press Information Bureau
PIN	Postal Index Number Code, India
PL 480	Public Law 480 (Enactment in USA under which foreign aid is given)
POW	Prisoner of War
PTI	Press Trust of India
PTO	Please Turn Over
PVC	Poly Vinile Chloride
Q	Queue
R/	Recipe (take) usually found in doctors' prescriptions
R & D	Research and Development
RMS	Railway Mail Service
RN	Royal Navy
RNA	Ribo Nucleic Acid
RPM	Revolutions per Minute
SALT	Strategic Arms Limitation Talks
SAM	Surface to Air Missile
SAS	Small Astronomy Satellite
SC	Supreme Court
SOS*	Save Our Souls
SSM	Surface to Surface Missile
SST	Supersonic Transport
STD	Subscriber Trunk Dialling/ Sexually Transmitted Disease (see VD)
TB	Tubercle Bacillus/Tuberculosis
TNT	Tri nitro toloune (an explosive)
UNI	United News of India
UP	Uttar Pradesh, India
UPSC	Union Public Service Commission, India
VAT	Value Added Tax
VD	Venereal Disease (see STD)
VIP	Very Important Person
ZIP Code	Zonal Improvement Plan Code (postal arrangement, USA)

77. RELIGIONS

Religions have played a very great part in the evolution of human civilization and culture. Very often they spread out from the lands of their origin.

Hinduism has left its permanent impact on Indian life and culture. Buddhism wrought revolutionary transformation in the life and culture of the peoples of South-East Asia and China. Christianity and Islam spread among the peoples of Asia and Europe kindling latent fires and opening fresh chapters in the history of the world.

The religions of the world may be grouped into three broad classes. 1. Leading religions, 2. Lesser religions and 3. Primitive religions. The leading religions are Buddhism, Christianity, Confucianism, Hinduism and Islam. The lesser religions include Jainism and Sikhism of India, Judaism of Palestine, Shintoism of Japan, Taoism of China and Zoroastrianism originally of Persia. The primitive religions count by the thousand. They are all very small communities, with a handful of votaries each. They are principally found among the aboriginal tribes of Australia, the Americas, India, Burma, South East Asia, Indonesia and Africa.

Buddhism. Buddhism was founded by Gautama Buddha who lived in the 6th century B.C.‡ Gautama, otherwise known as Siddhartha, was the son of an Indian prince, Suddhodana, chief of the Sakyas. Even as a child he was given to contemplation. The sorrows and sufferings of the world tormented his loving heart and he abandoned his princely home, his wife and child and started in pursuit of enlightenment at the age of 29. After years of wandering and contemplation Gautama at last found enlightenment while meditating under a great peepul tree. From that day, he came to be known as the *Buddha* or the Enlightened One.

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* This is not an acronym in the true sense. It is a distress signal in Morse Code. 3 dots (S) 3 lines (O) 3 dots (S)

‡ The actual dates of Buddha's birth and death are disputed.

The Buddha preached that emancipation from the cycle of rebirths, i.e., *Nirvana,* can be attained by a path of self-purification. He attached little importance to rituals and ceremonies in which the Brahmin priests indulged. He does not appear to have even envisaged the existence of a Supreme God. He preached in the vernacular of the people, a simple doctrine of love and mercy which appealed to all.

Buddhism is essentially a religion of kindness, humanity and equality. It denounces all claims to superiority on grounds of birth or caste. The eminence or lowness of men is determined by their own conduct and actions.

Hinayana and Mahayana. Two or three centuries after the death of the Buddha, we find the Buddhist religion divided into two broad schools, the Hinayana and the Mahayana. The Hinayana school prided itself on maintaining the teachings of the Buddha in their original form. The Mahayana school converted the human Buddha—*Sakya muni*—into an eternal and supreme deity, presiding over the world and succouring his devotees.

Mahayana Buddhism is prevalent in China, Tibet, Korea and Mongolia. Hinayana Buddhism is prevalent in Burma, Sri Lanka, Cambodia and Vietnam.

The most sacred places of Buddhism are Lumbini in Nepal, where the Buddha was born, the Bodh Gaya (UP), where he received enlightenment and Kusinagara (UP), where he attained *nirvana*

Christianity. Christianity founded by Jesus Christ now commands the largest following in the world. Christ was born in B.C. 4 in Judea. He started preaching about the Kingdom of God when he was thirty. His activities roused the opposition of the Jewish high priests who accused him of blasphemy. He was crucified under the orders of Pontius Pilate, the Roman Governor. After three days, Christ was resurrected from the dead. With the Resurrection of Christ, his disciples took heart and went about preaching the kingdom of God to all the peoples of the world.

Christianity spread throughout the Roman Empire where it was made the state religion in the 4th century A.D. Later, the Church split into two broad groups—the Western Church under the Pope in Rome, and the Eastern Churches under the Patriarchates of Antioch, Alexandria and Constantinople. Still later, further disruptions took place. The Roman Church was broken up by Protestantism, while in the Eastern Churches, many communities like the Armenians, Ethiopians, Russians and Indians set up their own Patriarchates.

Jerusalem, where Christ lived and preached, is the most sacred place to Christians all over the world.

Confucianism. Kung Fu Tsu, better known as Confucius, was born in 551 B.C. in China. Even as a young man, he had an ardent thirst for knowledge. When still in his youth, he met and talked with Lao-tse who was then a famous figure. Struggling through poverty, Confucius first became a minor civil servant and later rose to be the magistrate of a state. His brilliant administration evoked the jealousy of others, who conspired to bring about his dismissal in 496 B.C. Thereafter he wandered about penniless and homeless, until in 478 B.C. he died, aged seventythree.

After his death, his sayings were collected in the *Analects* and he was honoured throughout China, as a deity ranking with the deities of Heaven and Earth. Confucius was a moralist rather than the founder of a religion. He conserved, systematised and taught the age-old teachings in China. He advocated regularity in life, temperance in food and drink and emphasised the importance of learning, loyalty and truthfulness. He formulated a golden rule of reciprocity, "what you do not want done to yourself, do not to others"—just a step short of the Laotsean and Christian doctrine of returning good for evil.

Peking is the city sacred to the adherents of both Taoism and Confucianism.

Hinduism The word *Hindu* or its derivatives do not find mention in any of the multitudinous books of the Hindu religion. Nor has the use of the word any sort of religious sanction. The word, as applied to religion, has come into use only in recent times. Originally, the word *Hindu* was the Persian rendering of the Indian word *Sindhu*—the Sanskrit name of the river Indus. The Persian name *Hindu* must have come into being in the 6th century B.C. when the territory round Indus formed part of the Persian Empire. But the name disappeared from India, with the exit of the Persians. It came back to India, centuries later, with the Muslim invasions from the north-west. At that time, however, the word *Hindu* simply meant *Indian* and had no religious connotation. Subsequently, under the Mughal emperors, the word assumed a religious tint and under the British it came to be applied exclusively to the people, who followed the age-old religion of India.

Early Vedic Literature. The basis of Hinduism lies in the four *vedas* of the Aryans. The word *veda* is derived from *vid*, to know. The vedas are known as *sruti*, or that which is heard or revealed. The orthodox Hindus think that the vedas are *anadi*, without a beginning. Others believe that the vedas were revealed to ancient *rishis* (sages). The *Rigveda* is the earliest and the most important of the four vedas. It is the oldest scripture in the world having been composed in the third millennium B.C. It consists of over 1000 hymns, a heterogeneous collection of prayers to gods like *Agni, Vayu, Varuna, Indra, Mitra, Soma, Ushas* and others, instructions on rituals, incantations, songs, and verses on nature. The other three vedas are more specialised. The *Yajur Veda* deals mainly with sacrificial invocations, the *Sama Veda* contains melodic invocations and the *Atharva Veda* deals with medicines and magical incantations.

Each Veda is divided into *mantras* (hymns), *Brahmanas* which explain the mantras and rituals, *Aranyakas*, mystic teachings meant for meditation in forests and *Upanishads*, speculations on Being and Reality. *Upanishad* literally means sitting down near and signifies a master-pupil relationship. The Upanishads are otherwise known as *Vedanta* (*anta* means end) since they occur at the end of the vedas. According to Dr. Radhakrishnan they number more than 200 though Indian traditions put them at 108. *Chhandogya, Mandukya, Isa, Kena, Katha, Mundaka, Svetasvatara, Taittiriya, Bruhadaranyaka, Prasna, Aitareya* are among the better known Upanishads.

Smriti is what is remembered. It supports *Sruti*. It lays down the laws of individual and social life. While Sruti is immutable, Smriti is changeable, since laws must change according to the times. Among the more famous smritis are those of *Manu, Yajnavalkya, Parasara, Narada, Bhrigu, Viswamitra, Apastamba and Bawdhayana*.

Vedangas, 'literally limbs or members of the veda', are meant to assist the study of the vedas and the performance of rituals. These include *Siksha* (phonetics and euphony), *Chhandas* (metre), *Vyakarana* (grammar), *nirukta* (etymology and glossary), *jyothisha* (knowledge of heavenly bodies, necessary for determining auspicious moments for sacrifices and other ceremonies) and *Kalpa* (ceremonials).

Early Aryan Religion. The early Aryan gods were deifications of natural forces, Agni, Varuna, Soma,Surya etc. They were worshipped with sacrifice. There were no temples or images. The sacrifices were performed on open altars, where a wood fire was lighted, and offerings of food and drink in the shape of meat, fat, butter, milk, cakes of barley and the spirituous drink *soma*, were offered to the gods, who were supposed to dwell in the sky. This was the vedic rite of *homa*, the quintessence of vedic religion.

Transformation of Aryan Religion. When the Aryans came to India, they encountered a highly civilised people—the Dravidians—the builders of the City Civilization of the Indus Valley. They defeated the Dravidians and probably enslaved them. But though superior in war, the Aryans were far behind the Dravidians in culture. Before long they succumbed to the superior culture of the pre-Aryans and adopted it for their own. *Graecia capta ferum victorem cepit** (Enslaved Greece made a slave of her rough conqueror).

The cultural history of Greece bears a close resemblance to that of India. Just as the conquering Greeks 'hellenised' the old Aegean legends of gods and goddesses, the Aryans who conquered India 'aryanised' the myths and practices of the Dravidians who preceded them directly and the Austrics, who pre-dated the Dravidians, and claimed them as their own.

Later Vedic Literature. The mainstay of popular Hinduism is the later vedic literature which consists of the *puranas* (old stories) and *itihasas* (epics). There are 18 puranas: *Matsya, Markandeya, Bhagavata, Bhavishya, Brahma, Brahmanda, Brahmavaivarta, Vayu, Vishnu, Varaha, Vamana, Agni, Naradiya, Padma, Linga, Garuda, Kurma,* and *Skanda*. There are also a number of *upa puranas* or minor puranas. Some puranas are believed to date back to the pre-Christian era. But many are believed to have been written between the third and the seventh centuries A.D.

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* Horace

The *puranas* largely draw upon the myths and legends of the pre-Aryan inhabitants of India—the Austrics and the Dravidians. They deal with the stories of creation, destruction and renewal of the universe, the genealogy of gods and *Manus* and with the solar and lunar races of kings. They combine history and legend. But it is hard to pick out historical facts from their legendary trappings.

The *Itihasas* or epics are two—the *Ramayana* by Valmiki and the *Mahabharata* by Vyasa. Both these great works drew their inspiration from pre-Aryan folk-lore. The story of Rama or *Ramayana* looks like a blend of three distinct stories of pre-Aryan origin, put together at different times and finally embellished as a national poem of epic dimensions. The *Mahabharata*, on the other hand, embodies the legends of the Aryans and the non-Aryans and was created consciously as the national poem of a new Hindu-nation of mixed origin welded into one people under Brahmana guidance.*

The popular gods of the early Aryans, Indra, Varuna, Agni, Soma, Surya and others yielded place in course of time to a group of more powerful and more personal gods, more profound and cosmic and more philosophical in conception—namely the puranic gods of Hinduism headed by *Siva-Uma* and *Sri-Vishnu*. *Siva* and *Uma* are clearly pre-Aryan gods. *Vishnu* was partly Aryan—a form of Sun god and partly Dravidian—the blue sky-god. *Sri* was an Aryan goddess to start with, the Indian counterpart of the European *Ceres*, but in her association with Vishnu as *Gajalakshmi*, she is indigenous and pre-Aryan.

The vedic religion considered Indra as the most prominent and the most powerful god and the Aryans eulogised him to a very high status in the Rig Veda. But he has been down-graded to an insignificant position in the Hindu pantheon, under the pressurising impact of Dravidian deities. *Ganesh*, the elephant-headed god, to whom no hymn is addressed in the *Rig Veda*, has come to occupy such prominence among the Hindu gods that he is worshipped as the first Lord in all sacred ceremonies. The worship of the banyan tree, the propitiation of deceased ancestors, the concept of *Yamaraj*—the God of Death, the idea of divine incarnation in the form of *Matsya* (fish) and *Kachyap* (tortoise) and the stories of *Sesanaga* and *Hanuman* (monkey-god) are definitely pre-Aryan. Coconut (narikel or naryal), rice, betel-leaf (tambul) etc. which were used in the pre-Dravidian austroloid culture, as offerings to their gods, are not only retained but have become indispensable in Hindu rituals.

What ultimately happened was that the simple forms of nature worship followed by the Aryans, was overwhelmed by the more sophisticated Dravidian culture. Many social customs widely prevalent among modern Hindus, are conspicuously Dravidian and find no mention in the vedas. As a matter of fact, the basic framework of modern Hinduism is essentially Pre-Aryan and pre-eminently Dravidian. The Aryans adopted this Pre-Aryan fabric and proclaimed it as their own inheritance.

The outstanding instance of the Dravidisation of the Aryan religion is found in the preponderant place given to the *puja* form of worship compared to the Aryan *homa*. Puja rite, which involves the offering of flowers, fruits, leaves, water etc. to an image or symbol of divinity is characteristically Dravidian. This is now the everyday form of worship for all Hindus—the homa being kept up artificially among limited groups of Brahmins or Kshatriyas. The imprimatur or theological sanction for puja is found in the *Bhagavad Gita*** which is the bedrock of modern Hinduism.

"If any offers me with devotion, a leaf, a flower, a fruit or water, I receive that offered in devotion by the person whose soul is disciplined." *Gita* IX, 26

"The context", as Dr. S. K. Chatterjee

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* S.K. Chatterjee—*Vedic Age, Bharat Vidya Bhavan*

** Bhagavad Gita occurs in the *Mahabharata* says, "makes it clear that here, we have an apology for non-vedic worship *vis-a-vis* the vedic fire-sacrifice; this verse, in fact, forms the great charter for the *puja* ritual within the *milieu* of Vedic Brahminism".*

The National Religion. Hinduism emerged as the national religion by a brilliant synthesis of Aryan and non-Aryan ideas. This ability to adopt or adjust alien ideas has made Hinduism a highly receptive and tolerant religion. It is this receptivity that has helped it to survive the onslaughts of other religions and influences through centuries.

When Buddhism rose as a challenge to orthodox Hinduism, Hinduism reacted by sanctifying the Buddha as an *avatar* of Vishnu. Similarly, the Jain idea of non-violence or non-injury to living things appealed to many people as a gospel of mercy, goodwill and fellowship with all living creatures. Hinduism took over the idea and worked it out as the doctrine of *Ahimsa*, which was elevated as the highest of all *dharmas*. In external trappings too, Hinduism established much common ground with Buddhism and Jainism. For example, the Bodhi (peepul) tree, under which the Buddha received enlightenment, and the Asoka tree under which Mahavira received inspiration, became as sacrosanct to Hindus, as they were to Buddhists or Jains. These trees are grown in many Hindu temples, as sacred trees, even today.

In spite of its great adaptability and accommodation, Hinduism has been rocked by dissensions and disputations. The bitter struggle between *Vaishnavites* and *Saivaites*, between supporters of the God Siva, lasted for a long time. But this was rather a struggle for supremacy in the Hindu fold—never a segregation from it.

Like all old religions, the appeal of Hinduism has flagged and waned from time to time. And from time to time, reformers have sprung up, brilliant intellects and devout ascetics like Sankaracharya (8th century A.D.), Ramanuja (12th century) and Madhwa (13th century)—who have not merely restored popular faith but also countered heretical or fissiparous tendencies, by a re-interpretation of Hindu philosophy and reformation of Hindu practices, to meet the demands of the times.

Modern Hinduism. Modern Hinduism may be dated from the days of Sri Sankaracharya, more than 1000 years ago. Sankara lived in the 8th century A.D. He was born at Kaladi in Kerala, of a Namboodiri Brahmin family. He is by far the greatest of Hindu reformers. Before he died at the early age of 32, he travelled through India thrice, debating with scholars and expounding his theory of *Advaita* or monism. He was not only a great thinker but also a great organiser. Among the most durable monuments to his organising zeal are the famous monasteries of *Sringeri* in Karnataka, *Dwaraka* in Gujarat, *Puri* in Orissa and *Badrinath* on the snowy heights of the Himalayas. He purged Hinduism of many evil cults and practices. Thus, the worship of the Mother Goddess, who was called by many names —*Devi, Durga, Kali, Lakshmi, Parvati, Amba, Amman* etc— had degenerated into licentiousness. Devi worship, in the past, was part of the *Sakta* cult with its five Makaras *matsya* (fish), *mamsa* (meat), *madya* (liquor), *mudra* (dance) and *maithuna* (copulation). Sankara reformed this cult and restored it to its original purity. Similarly, he is said to have put down the *Kapalikas*, who indulged in human sacrifices to appease God Bhairava. Sankara thus rejuvenated Hinduism and gave it a new philosophy and a new look.

Ramanuja, the next great reformer lived in the 12th century A.D. He was born in Sriperumbadur in Tamil Nadu. He modified Sankara's philosophy of *Advaita* and preached a new philosophy *Visishtadvaita* or qualified monism. Ramanuja laid great emphasis on *bhaktimarga* or deliverance by way of devotion to a compassionate god, in contrast to *Karmamarga* or the way of deliverance by the performance of vedic rites.

Madhwa, born in 1238, near Udipi in Karnataka is the third of the great reformers. He is the supreme exponent of *dvaita* or dualism. All these great reformers stressed the importance of *bhakti* or devotion to a personal god.

The renovation of Hinduism started by this great trio of the south, was continued by a number of saints and sages in the rest of India. Ramananda of Allahabad, Vallabhacharya of Benares, Namadeva of Maharashtra, (who unlike others came from a low caste), Mirabai of Rajasthan (a princess turned *sanyasin*), Ekanath, Tukaram and

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* Vedic Age

Ramdas, all from Maharashtra, Surdas, the blind poet of Agra, Lalla of Kashmir, and others. All these saints and sages propagated the Bhakti movement by songs and other literary compositions in the regional languages. The adoption of the local vernaculars as the medium popularised the movement and carried it to every nook and corner of India. The institution of *Bhajana* or group singing of devotional songs thus became established all over India.

The greatest of the *bhakti* leaders and one of the greatest reformers of Hindu religion is Chaitanya (1485-1533), who hailed from a Brahmin family in Bengal. At the age of 24 he became a *sanyasin* and spent the rest of his life, preaching the bhakti movement all over North India.

Organised work for the revitalisation of Hinduism, started with Swami Dayananda Saraswati (1824-1883). He founded the *Arya Samaj* and started the *Sudhi* (purification) movement, for the conversion of non-Hindus to Hinduism. He was a great Sanskrit scholar and admonished his followers to go back to the Vedas. His work was continued after his death by a number of people, the most famous among them being Swami Sraddhananda who met a tragic end, when he was convalescing from an attack of pneumonia. He was stabbed to death by a fanatic Muslim.

The next great reformer, in point of time, was Ramakrishna Paramahamsa (1836-1886). He was a poor priest in a temple of Calcutta, without any formal education, eastern or western. But he was a deeply religious man, who believed in the inherent truth of all religions. His catholicity, mysticism and spiritual fervour attracted a small band of devoted disciples. They formed a Mission, named after him the Ramakrishna Mission.

The most famous leader of the Mission was Narendranath Datta, an English-educated disciple of Paramahamsa. In later years, he became famous as Swami Vivekananda and carried the message of Hinduism to far off countries like USA. The Ramakrishna Mission stands for social and religious reforms, based on the ancient culture of India.

Islam. Mohammed, the founder of Islam, was born in Mecca in A.D. 570. He lost his parents in early childhood and was brought up by his grandfather. Mohammed felt revolted by the idolatry and licentiousness of the people around him. He condemned idolatry and started preaching the doctrine of "One God". He raised a number of enemies by his preaching and was at last compelled to flee from Mecca to Medina in A.D. 622. Hejira or the Mohammedan Calendar begins from this date (Sept. 13). At Medina his followers increased and he was confident enough to return to Mecca. Thereafter, the believers swelled rapidly and before his death in A.D 632 Islam had spread throughout Arabia. The teachings of Mohammed are contained in the Holy *Quran* which is one of the finest literary works in Arabic.

Islam later split up into two sects, Sunnis and Shias. Sunnis constitute the majority of the Muslim population and are found in Asia, Africa and Europe. The majority of the Shias is found in Iran, Iraq and Afghanistan.

Mecca is the sacred city and place of pilgrimage for all Muslims.

Jainism. Jainism derives its name from Jaina (the conqueror), the surname of Vardhamana Mahavira. Mahavira, like Buddha, belonged to a princely family in Vaisali. At the age of 30, Mahavira, renounced the world and spent 12 years in austerity and meditation in search of truth. At last, at the age of 42, while meditating under an asoka tree, he received enlightenment. He was thereafter known as Jaina, the Conqueror

According to Jain legends, Mahavira was born in the beginning of the sixth century B.C.* The actual dates of his birth and death are hotly disputed and may best be left alone

Jainism preaches that by following the threefold path, all souls will be released from the cycle of births and deaths and will reach the pure and blissful abode above (Sidha Sala). The threefold path consists of three jewels (triratna), right belief, right cognition and right conduct

After A.D. 82 Jainism split into two

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*"The 2500th Nirvana Anniversary of Mahavira was celebrated as a national festival for one year commencing on 13th November, 1974"

groups, the Digambaras and the Svetambaras. The Digambaras wore no clothes, while the Svetambaras wore white clothes. Both groups believed in overcoming the senses by meditation and penance.

The Jains have many places of pilgrimage in India. The most important of them are the mountain of Samata, near Parsanath in Bihar, where Parsua is said to have attained nirvana; Papapuri or Pavapuri where Mahavira died; Mount Abu in Rajasthan and Shravenbelgol in Karnataka, where the temples of Tirthankara, Parsua and Neminath are situated, and the high monolithic statue of Gomateshwar, son of Rishala, stands.

Judaism. Judaism, the religion of the Hebrews was in existence long before its first prophet and lawgiver Moses came on the scene. The first historical figure among the Hebrews is Abraham, who left Ur in Chaldaea with the Hebrew tribe, about 2000 B.C. After a long period of wandering in the Arabian desert, the Hebrews at last settled in Egypt. However, they were enslaved by the mighty Pharaohs. It was left to Moses to liberate the Hebrews from Egyptian bondage and to lead them to a land of milk and honey promised them by God. On the way, at Mount Sinai, Moses received the 'Ten Commandments' from 'Yahweh' or Jehovah, the Supreme God. By the time the Hebrews had settled in the Promised Land, the first five books of Moses had been written.

The Hebrews organised themselves into the Kingdom of Israel round about 1000 B.C. In 586 B.C. Nebuchadnessar conquered Israel and carried off the Hebrews into the Babylonian Captivity. With the conquest of Palestine by Cyrus, the Hebrews were resettled in Israel. It was during this period that the writings of the Prophets and the Psalms were codified. The Law, the Prophets and the Psalms remained as separate holy books until the time of Christ, when they were put together as the Hebrew Bible or the Old Testament. The Talmud, which is a collection of detailed laws for the guidance of civil, domestic and social life, was completed during the 4th and 5th centuries A.D.

Judaism is a simple religion which aims at a moral life. To the Jews, right conduct is more important than right belief. According to the Talmud every good man is assured of heaven, the gentile who observes the moral law being the equal of the High Preist. Judaism is free from sentimentalism and is averse to self-imposed suffering, idleness and asceticism. Jerusalem is the Holy City of the Jews.

Shintoism. Shinto is the national religion of Japan. The word "Shinto" means "the way of the spirits", the underlying principle being ancestor worship. It must have evolved gradually, accumulating fresh material as ages passed without any religious reformer directing it or altering it. It has no sacred books or moral code. It is the religion of the followers of Mikado, the Japanese Emperor. The Mikado is, in fact, the focal point of the religion, the only God that it knows. There are, however, innumerable deities. Except for certain rituals developed through the ages, Shinto has no religious content or appeal.

The central shrine of Shintoism is at Ise, in Central Japan, to which all devout Japanese make pilgrimages. Shintos are found almost exclusively in Japan.

Table 57

Estimated Membership of Religions*

*Religions***		*Numbers*
Buddhist		254,867,450
Christian		
Roman Catholic	579,562,300	
Eastern Orthodox	76,444,600	
Protestant	341,496,740	997,503,640
Confucian		156,070,100
Hindu		477,991,300
Jewish		14,336,520
Muslim		589,143,400
Shinto		57,154,200
Taoist		31,286,000
Zoroastrian		271,000
Total Membership		2,578,623,610
Total Population (UN Estimate, mid-1980)		4,414,722,000

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* The estimates include communist countries which do not officially recognise any religion.

** For Jainism and Sikkhism, see INDIA.

Source: Britannica Book of the year, 1981.

Sikhism. The Sikh religion was founded by Guru Nanak who lived in the Punjab between A.D. 1469 and 1538. He was very much troubled at the frequent quarrels between Hindus and Muslims. He preached that there was only one God for Hindus and Muslims; and tried to work out a synthesis of the two religions. His mission became popular and he very soon had a large following. He travelled extensively, going as far as Mecca, and was in frequent contact with the leading sages of Hindu and Muslim religions. On his death, he was succeeded by his disciples who became Gurus in their turn. The Gurus have built up the modern Sikh community. The fifth guru, Guru Arjan Mahal (1581-1606) compiled the *Adi Granth*, the first sacred book of the Sikhs. The most famous Guru is Guru Govind Singh (d.1708). He organised the Sikhs into a militant community. He instituted *pahul* or baptism in water stirred by a dagger. Those who were baptised were known as the *Khalsa*(pure) with the designation *Singh* (lion). All members of the Khalsa had to wear the 5 K's-*Kes* (long hair), *Kangha* (comb), *Kripan* (sword), *Kachcha* (short drawers) and *Kara* (steel bracelet). The Khalsa soon emerged as a valorous fighting unit. It enabled the Sikhs to form a state of their own under Maharaj Ranjit Singh.

The growth of the British power in India reduced the Sikhs to submission. But they continued to be fighters and soon came to be described as the fighting arm of the British. The majority of the Sikh population is found in the Punjab and the city of Delhi. Their most important sacred place is the Golden Temple at Amritsar.

Taoism. Lao-tse, the founder of Taoism, was born in China about the sixth century B.C. Lao-tse put down his teachings in a book called Tao-Teh-King, which became the Taoist Bible. "Tao" originally meant "road" or way, but later came to signify the perfect reality. Taoism preached goodness, simplicity, purity and gentleness in everyday life. The three jewels of Taoism are compassion, moderation and humility. Lao-tse taught what Christ later preached, the return of good for evil. "When you are reviled, cherish no resentment, be kind and generous without seeking any return."

Lao-tse's philosophy, highbrow as it was, failed to evoke response in the common man. The disciples of Lao-tse used "Tao-Teh-King" as a source book for magic, and Taoism degenerated into mere ritual. By the middle of the second century B.C., Taoism had debased itself so far as to deify Lao-tse, who was worshipped with sacrifice.

Zoroastrianism. Zarathushtra or Zoroaster, the founder of Zoroastrianism, was born in Medea (modern Iran) about 660 B.C. He thought that life was a struggle between the forces of good and evil. The spirit of good was Ahura Mazda with its helper Mithras, the Light. The evil spirit was Angra Mainyu or Ahriman, the Lie Demon. Man could not be neutral in the struggle. He had to fight for right and live a righteous life. Those who lived righteously went to paradise which was a state of immortal holiness in thought, word and deed. The impious were condemned to an eternal hell of evil thoughts and deeds and physical torment. By 500 B.C. Zoroastrianism had become the leading faith in Persia and Medea.

The sayings of Zoroaster were gathered into a book, called Avesta or Zend Avesta, which became the Bible of the Persians.

The Zoroastrians who fled to India during the 8th century, were the ancestors of the present Parsi community in India. The Parsis in India who number around 1,000,000 represent the flower of the present day Zoroastrian community.

78. POPULATION PROBLEM

Malthusian Theory. Some two centuries ago (1789), the Rev. Thomas Malthus, then an unknown English curate, published a booklet—*Eassy on Population*. In this book Malthus made the terrible prognosis that human population will soon outrun the means of subsistence (food supply). Ever since, the nations of the world have been keeping their fingers crosed, mutely watching the galloping population and wondering when the doom will fall. But things did not work out quite the way that Malthus predicted

True, population kept mounting without a pause. In 1830—some fifty years after the Malthusian prognosis—human population reached one thousand million for the first time in history. In another century (1830-

1930) it had doubled itself to 2000 million. In about a generation (1930-1960) a third thousand million was added. In a little more than a decade thereafter, (1960-1974) the population increased by about 700 million. If the population trends continue at this rate, we shall have more than 7400 million people by 2000 A.D.

The problem of population lies, not as much in the total number of heads at any given time, as in the growth rate, that is, the rate at which population increases. Between 1960 and 1970 world population showed an average growth rate of 2.5 per annum. If population is to increase at this rate, it will easily double itself in thirty years. If the growth rate continues, we shall have population doubling itself every thirty years, in endless succession.

But surprisingly, food production kept pace with population demolishing the Malthusian theory that population would increase in geometrical progression‡ while agricultural production would only increase in arithmetical progression.‡ Large scale mechanised farming was the first great step in agricultural expansion. Then came the Green Revolution and the techniques of intensive cultivation. The Malthusian ghost of food shortage was thus laid—apparently for ever.

For two decades ending in 1972, the world had in fact an oversupply of cereal grains and the main exporters were forced to cut down production drastically. In 1972 the tables were suddenly turned. Agricultural production slumped, in many parts of the world, mainly on account of weather. Severe shortages of food verging on famine plagued many countries. The pressure was so great that it was even suggested that advanced nations should cut down on meat in order to save more foodgrains for mankind.† The critical food situation remained unchanged through 1973 and continued well into 1974.

World Conferences 1974. It was at this time when the food horizon was overcast, that the UN summoned two World Conferences—one on Population at Bucharest in Aug. 1974 and the other on Food at Rome in Nov. 1974. The two Conferences worked out an overall assessment of world food production vis-a-vis population. What emerged from the assessment was that world food production, incuding all items of food (foodgrains, tubers and other vegetables and meat, fish, milk and eggs) did not materially fall. The trouble lay in the alignment of production between the various countries of the world. Advanced countries, by and large, remained surplus in food production. It was the developing countries that registered heavy shortages in vital articles of food. The consequence was that the advanced countries faced no problem—either of population or of food, whereas the developing countries faced it both ways—in population and in food supply.

Zero Growth Rate. It has been taken for granted that the advanced nations faced no population problem since they were steadily settling down to the zero growth rate in population. Zero growth means that the population will keep steady through generations. In other words, births will be just enough to compensate deaths, never more. Our faith in zero growth rate was so intense that we had overlooked the other end of the problem, namely that births may be less than deaths and thus pull down the population to dangerous limits. The zero rate has dispelled the nightmare of Malthusian overpopulation. But it has at the same time turned up another nightmare—underpopulation—at least in Europe. The latest reports show that Europe is getting underpopulated.

While India and most of the world wrestle with the staggering problem of increasing numbers, much of western Europe is preoccupied with the opposite problem. In fact there are economists in Europe who think that zero population growth is their biggest enemy.

Optimum Population. The ideal population is the optimum population. We speak of overpopulation when numbers exceed resources and of underpopulation when production falls short of numbers. If there is overpopulation there will not be enough goods to go round. If there is underpopulation there will not be enough hands to produce the necessary goods and services.

Some people think that we shall

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‡ Geometrical Progression 1,2,4,8,16 etc.
Arithmetical Progression 1,2,3,4,5 etc.

† The assumption is that cattle have to be fed 20 pounds of grain, for every pound of beef.

rather have a shortage of goods than a surplus of men. The lesser evil, no doubt, but evil none the less. If we decide to get along with less goods and services, we shall have to choose a very low standard of life and opt for dissatisfaction all round. A society accustomed to supersonic transport, air-conditioned houses, piped water, electric gadgets, chic clothes and choice foods will soon find the going rough. It will not be long before 'death wish' overtakes all.

Table 58

WORLD POPULATION

World population growth is slowing down — but it could be 130 years before it finally stops. By that time the world's population will be 10.5 billion, or two and a half times its present size.

REGION, COUNTRY, OR AREA	Population (in thousand) mid-year 1980	Gross repro-duction rate 1980-85	Expectation of life at birth both sexes 1980-85
WORLD TOTAL	**4432147**	**1.77**	**59.2**
MORE DEVELOPED REGIONS (*)	1131339	0.98	72.5
LESS DEVELOPED REGIONS (+)	3300809	2.04	57.0
AFRICA	**469982**	**3.10**	**50.9**
EASTERN AFRICA	133501	3.26	49.2
British Indian Ocean Terr.	2	—	—
Burundi	4241	3.00	43.5
Comoros	358	3.01	48.1
Djibouti	310	—	—
Ethiopia	31468	3.30	41.1
Kenya	16466	4.00	56.0
Madagascar	8742	3.00	48.6
Malawi	6162	3.45	48.6
Mauritius (1)	959	1.35	65.9
Mozambique	10473	3.00	48.6
Reunion	525	1.10	66.5
Rwanda	4797	3.40	48.4
Seychelles	65	—	—
Somalia	4637	3.00	43.6
Uganda	13201	3.00	55.0
United Rep. of Tanzania	17934	3.20	53.0
Zambia	5766	3.40	50.8
Zimbabwe	7396	3.25	55.5
MIDDLE AFRICA	53093	2.96	47.0
Angola	7078	3.15	43.6
Central African Republic	2294	2.90	44.6
Chad	4455	2.90	40.8
Congo	1537	2.95	48.5
Equatorial Guinea	363	2.79	48.5
Gabon	548	2.30	46.1
Sao Tome and Principe	85	—	—
United Rep. of Cameroon	8444	2.79	48.5
Zaire	28291	3.00	48.5
NORTHERN AFRICA	109017	2.84	56.0
Algeria	18919	3.50	57.7
Egypt	41963	2.29	57.2
Libyan Arab Jamahiriya	2978	3.53	57.8
Morocco	20296	3.14	57.8
Sudan	18371	3.20	49.0

Tunisia	6354	2.40	59.6
Western Sahara	135	—	—
SOUTHERN AFRICA	32998	2.55	61.1
Botswana	807	3.20	50.8
Lesotho	1341	2.65	52.8
Namibia	1009	2.90	53.8
South Africa	29285	2.50	62.4
Swaziland	557	3.19	48.4
WESTERN AFRICA	141372	3.33	48.6
Benin	3530	3.30	48.4
Cape Verde	324	1.30	62.2
Gambia	603	3.15	42.6
Ghana	11679	3.30	50.8
Guinea	5014	3.05	46.1
Guinea-Bissau	573	2.65	43.5
Ivory Coast	8034	3.30	48.6
Liberia	1967	3.40	55.4
Mali	6940	3.30	43.4
Mauritania	1634	3.40	43.4
Niger	5318	3.50	43.4
Nigeria	77082	3.40	50.1
St. Helena (2)	5	—	—
Senegal	5661	3.20	43.4
Sierra Leone	3474	3.02	48.4
Togo	2625	3.20	48.6
Upper Volta	6908	3.20	43.4
AMERICAS			
LATIN AMERICA	363704	2.05	64.2
CARIBBEAN	30648	1.59	64.2
Antigua	75	—	—
Bahamas	241	—	—
Barbados	263	1.00	71.2
British Virgin Islands	14	—	—
Cayman Islands	17	—	—
Cuba	9732	0.96	73.5
Dominica	83	—	—
Dominican Republic	5947	2.07	62.6
Grenada	111	—	—
Guadeloupe	329	1.20	70.4
Haiti	5809	2.80	52.8
Jamaica	2188	1.60	71.2
Martinique	325	1.20	70.4
Montserrat	11	—	—
Netherlands Antilles	256	—	—
Puerto Rico	3675	1.05	73.4
St. Kitts-Nevis-Anguilla	74	—	—
Saint Lucia	118	—	—
St. Vincent-The Grenadines	97	—	—
Trinidad and Tobago	1168	1.67	70.3
Turks and Caicos Islands	6	—	—
U.S. Virgin Islands	111	—	—
MIDDLE AMERICA	92538	2.41	65.1
Belize	162	—	—
Costa Rica	2213	1.55	71.0
El Salvador	4797	2.71	64.9
Guatemala	7262	2.52	60.8
Honduras	3691	3.17	60.0
Mexico	69752	2.37	66.0

Nicaragua	2733	3.03	57.7
Panama	1896	1.74	70.8
Canal Zone	31	—	—
TEMPERATE SOUTH AMERICA	41067	1.38	69.1
Argentina	27036	1.36	70.0
Chile	11104	1.42	67.1
Falkland Is. (Malvinas)	2	—	—
Uruguay	2924	1.36	70.4
TROPICAL SOUTH AMERICA	199452	2.09	63.0
Bolivia	5570	3.05	50.8
Brazil	122320	1.96	63.5
Colombia	25794	1.92	63.7
Ecuador	8021	2.93	62.6
French Guiana	62	—	—
Guyana	883	1.59	70.5
Paraguay	3168	2.37	65.2
Peru	17625	2.58	59.2
Suriname	388	2.77	68.9
Venezuela	15620	2.11	67.8
NORTHERN AMERICA	247835	0.98	73.4
Bermuda	60	—	—
Canada	24484	0.88	74.1
Greenland	52	—	—
St. Pierre and Miquelon	6	—	—
United States of America	223233	0.99	73.3
ASIA			
EAST ASIA	1174874	1.19	69.9
China	994913	1.20	69.8
Japan	116551	0.85	76.4
OTHER EAST ASIA	63410	1.55	65.4
Hong Kong	5106	1.05	76.1
Korea	56348	1.57	64.7
Dem. Peo. Rep. of Korea	17892	1.95	64.7
Republic of Korea	38455	1.40	64.7
Macau	287	—	—
Mongolia	1669	2.40	64.7
SOUTH ASIA	1403736	2.34	52.8
EASTERN SOUTH ASIA	361245	2.12	55.1
Brunei	228	—	—
Burma	35289	2.60	55.1
Democratic Kampuchea	6747	2.30	43.5
East Timor	755	2.85	45.1
Indonesia	148033	2.00	50.0
Lao People's Dem. Rep.	3721	2.85	46.1
Malaysia	14068	1.95	65.3
Philippines	49211	2.20	62.8
Singapore	2390	0.90	71.7
Thailand	47063	1.90	62.3
Viet Nam	53740	2.30	55.1
MIDDLE SOUTH ASIA	944141	2.39	51.2
Afghanistan	15940	3.35	40.5
Bangladesh	88164	3.05	47.3
Bhutan	1296	2.90	45.3
India	684460	2.20	51.6
Iran	38126	2.90	56.1
Maldives	154	—	—
Nepal	14288	3.00	45.3

Pakistan	86899	2.93	52.6
Sri Lanka	14815	1.75	66.5
WESTERN SOUTH ASIA	98350	2.66	60.0
ARAB COUNTRIES	48539	3.26	57.6
Bahrain	313	2.26	67.8
Democratic Yemen	1858	3.35	46.6
Gaza Strip (Palestine)	438	—	—
Iraq	13072	3.25	57.5
Jordan	3244	3.45	62.2
Kuwait	1353	3.00	70.4
Lebanon	2658	1.85	67.0
Oman	891	3.45	49.8
Qatar	237	3.30	58.8
Saudi Arabia	8960	3.45	55.5
Syrian Arab Republic	8977	3.50	66.3
United Arab Emirates	726	3.30	63.6
Yemen	5812	3.30	43.8
NON-ARAB COUNTRIES	49811	2.11	63.3
Cyprus	620	1.12	72.9
Israel	3937	1.57	72.7
Turkey	45254	2.17	62.6
EUROPE	**483704**	**0.93**	**72.7**
EASTERN EUROPE	110024	1.07	71.5
Bulgaria	9007	1.09	72.6
Czechoslovakia	15336	1.11	70.5
German Dem. Rep. (3)	16854	0.86	72.5
Hungary	10754	1.00	70.9
Poland	35805	1.10	71.7
Romania	22268	1.19	71.3
NORTHERN EUROPE	82004	0.83	73.5
Channel Islands	133	—	—
Denmark	5122	0.81	74.6
Faeroe Islands	41	—	—
Finland	4863	0.78	73.2
Iceland	231	0.99	76.4
Ireland	3308	1.55	73.0
Isle of Man	67	—	—
Norway	4079	0.86	75.4
Sweden	8274	0.75	75.6
United Kingdom	55886	0.80	73.1
SOUTHERN EUROPE	138969	1.03	72.6
Andorra	31	—	—
Albania	2732	1.75	70.1
Gibraltar	29	—	—
Greece	9329	1.12	73.4
Holy See	1	—	—
Italy	56940	0.88	73.4
Malta	343	0.95	71.9
Portugal	9836	1.11	71.2
San Marino	21	—	—
Spain	37378	1.17	73.4
Yugoslavia	22328	1.00	70.6
WESTERN EUROPE	152707	0.78	73.6
Austria	7481	0.78	72.5
Belgium	9833	0.80	72.6
France	53508	0.89	74.3
Germany, Fed. Rep. of (3)	60931	0.69	72.6

Liechtenstein	26	—	—
Luxembourg	358	0.72	72.4
Monaco	26	—	—
Netherlands	14079	0.75	75.1
Switzerland	6466	0.71	75.1
OCEANIA	**22820**	**1.33**	**66.8**
AUSTRALIA-NEW ZEALAND	17756	0.98	73.6
Australia	14488	0.97	73.7
New Zealand	3268	1.02	73.5
MELANESIA	3645	2.92	54.1
New Caledonia	142	—	—
Norfolk Island	2	—	—
Papua New Guinea	3154	2.90	59.0
Solomon Islands	229	—	—
Vanuatu	118	—	—
MICRONESIA-POLYNESIA	1419	2.08	66.1
MICRONESIA	327	2.43	64.8
Guam	103	—	—
Kiribati	58	—	—
Nauru	7	—	—
Niue	4	—	—
Pacific Islands	137	—	—
Tuvalu	7	—	—
Other Micronesia (4)	11	—	—
POLYNESIA	1091	1.99	66.5
American Samoa	32	—	—
Cook Islands	19	—	—
Fiji	630	2.70	61.1
French Polynesia	147	—	—
Samoa	157	—	—
Tonga	97	—	—
Wallis and Futuna Is.	10	—	—
U.S.S.R.	265493	1.15	70.1

NOTES-

(*) MORE DEVELOPED REGIONS INCLUDE NORTHERN AMERICA, JAPAN, ALL REGIONS OF EUROPE, AUSTRALIA NEW ZEALAND AND UNION OF SOVIET SOCIALIST REPUBLICS.

(+) LESS DEVELOPED REGIONS INCLUDE ALL REGIONS OF AFRICA. ALL REGIONS OF LATIN AMERICA, CHINA, OTHER EAST ASIA, ALL REGIONS OF SOUTH ASIA, MELANESIA AND MICRONESIA—POLYNESIA.

(1) INCLUDING AGALESA, RODRIGUES AND ST BRANDON

(2) INCLUDING ASCENSION AND TRISTAN DA CUNHA.

(3) THE DATA WHICH RELATE TO THE FEDERAL REPUBLIC OF GERMANY AND THE GERMAN DEMOCRATIC REPUBLIC INCLUDE THE RELEVANT DATA RELATING TO BERLIN FOR WHICH SEPARATE DATA HAVE NOT BEEN SUPPLIED THIS IS WITHOUT PREJUDICE TO ANY QUESTION OF STATUS WHICH MAY BE INVOLVED.

(4) INCLUDING CANTON AND ENDERBURY ISLANDS. CHRISTMAS ISLAND. COCOS (KEELING) ISLANDS. JOHNSTON ISLAND. MIDWAY ISLANDS. PITCAIRN ISLAND, TOKELAU AND WAKE ISLANDS

Source: UNFPA

79. INTERNATIONAL ORGANISATIONS

(i) UNITED NATIONS

Headquarters: First Avenue, U.N. Plaza, New York City, NY., USA.

The United Nations Organisation (UNO) is an association of sovereign states, who have bound themselves by a charter to maintain international peace and security, to ensure that armed force shall not be used, save in the common interest, and to employ international machinery for the promotion of the economic and social advancement of all peoples.

Membership of the UN is open to all peace-loving nations who accept the principles of the United Nations Charter and are willing and able to carry out its obligations. New members are admitted by the General Assembly on the recommendations of the Security Council. Members can be expelled or suspended in the same manner.

The official languages of the UN are *Arabic, Chinese, English, French, Russian* and *Spanish.*

The Charter of the United Nations was signed by the delegates of 50 nations on 26th June, 1945 at San Francisco. The UN formally came into existence on 24th Oct., 1945. Starting with fifty members in 1945 the UN has now on its rolls almost all the independent countries of the world. For a long time China was represented in the UN by Taiwan which styled itself Nationalist China. Communist China which truly represented China was kept out of the UN mainly on account of the US veto. This anomaly was removed in 1971 by admitting Communist China as the representative of all China in the UN. Red China thus became a permanent member of the Security Council. Taiwan not only lost its permanent seat in the Council but also its primary membership of the UN.

Economic Charter. In Dec. 1974 the UN adopted a Charter of Economic Rights. This charter consisting of 34 articles is a landmark in the history of UN. It includes the right of each state "to freely exercise full permanent sovereignty over its wealth and natural resources, to regulate and exercise authority over foreign investments within its national jurisdiction and to nationalise, expropriate or transfer the ownership of foreign property".

The charter recognises the right of States to associate in organisations of primary commodity producers in order to develop their national economies, the right to benefit from the advances in science and technology and the right to ensure that the exploitation of the resource of the sea-bed are carried out exclusively for peaceful purposes and the benefits shared equitably by all States.

NIEO. The 1974 declaration of rights opened a new chapter in the history of the UN. It recognised the imperative necessity of reducing disparities between developed, developing and undeveloped countries of the world. It envisaged a New International Economic Order (NIEO). To achieve this new order the UN Development Programme (UNDP) was inaugurated in 1975 under a Director General of Development.

Principal Organs of the UN are: *General Assembly, Secretariat, Security Council, Trusteeship Council, Economic and Social Council and International Court of Justice.*

General Asembly. The General Assembly of the UN is the nearest that the world has yet come to the visionary 'Parliament of Man'. The Assembly consists of the representatives of all the member states. Each state has one vote, but may send 5 representatives. The General Assembly meets at least once in a year. Special sessions may be summoned by the Secretary General, on a request by the Security Council.

The General Assembly passes the annual budget of the UN and determines the contribution payable by each member. It receives and considers the reports of the special committees including the Security Council. Important questions are decided by a two-thirds majority and other questions by a simple majority. The General Assembly elects the non-permanent members of the Security Council, the members of the Economic and Social Council and the elected members of the Trusteeship Council. The Judges of the International Court of Justice are elected by the General Assembly, in conjunction with the Security Council. The General Assembly elects its own President and Vice Presidents every year.

The work of the General Assembly is divided amongst 7 main committees on each of which every member state has the right to be represented by one delegate. The committees are *Political and Security Committee, Economic and Financial Committee, Social, Humanitarian and Cultural Committee, Trusteeship Committee, Administrative and Budgetary Committee, Legal Committee, Special Political Committee.*

The work of these committees is coordinated by a *General Committee,* which consists of 25 members comprising the President of the General Assembly, its 17 Vice-Presidents and the Chairmen of the 7 main committees.

MEMBERS OF THE UN

Names of 157 members of the UN as in 1982 are given below.

TABLE 59

Member	*Date of Admission*
Afghanistan	19 Nov. 1946
Albania	14 Dec. 1955
Algeria	8 Oct. 1962
Angola	1 Dec. 1976
Antigua & Barbuda	11 Nov. 1981
Argentina*	24 Oct. 1945
Australia*	1 Nov. 1945
Austria	14 Dec. 1955
Bahamas	18 Sept. 1973
Bahrain	21 Sept. 1971
Bangladesh	17 Sept. 1974
Barbados	9 Dec. 1966
Belgium*	27 Dec. 1945
Belize	25 Sept. 1981
Benin†	20 Sept. 1960
Bhutan	21 Sept. 1971
Bolivia*	14 Nov. 1945
Botswana	17 Oct. 1966
Brazil*	24 Oct. 1945
Bulgaria	14 Dec. 1955
Burma	19 Apr. 1948
Burundi	18 Sept. 1962
Byelorussian Soviet Socialist Republic*	24 Oct. 1945
Canada*	9 Nov. 1945
Cape Verde	16 Sept. 1975
Central African Republic	20 Sept. 1960
Chad	20 Sept. 1960
Chile*	24 Oct. 1945
China*‡	24 Oct. 1945
Colombia*	5 Nov. 1945
Comoros	12 Nov. 1975
Congo	20 Sept. 1960
Costa Rica*	2 Nov. 1945
Cuba*	24 Oct. 1945
Cyprus	20 Sept. 1960
Czechoslovakia*	24 Oct. 1945
Democratic Kampuchea¶	14 Dec. 1955
Democratic Yemen	14 Dec. 1967
Denmark*	24 Oct. 1945
Djibouti	20 Sept. 1977
Dominica	18 Dec. 1978
Dominican Republic*	24 Oct. 1945
Ecuador*	21 Dec. 1945
Egypt*	24 Oct. 1945
El Salvador*	24 Oct. 1945
Equatorial Guinea	12 Nov. 1968
Ethiopia*	13 Nov. 1945
Fiji	13 Oct. 1970
Finland	14 Dec. 1955
France*	24 Oct. 1945
Gabon	20 Sept. 1960
Gambia	21 Sept. 1965
German Democratic Republic	18 Sept. 1973
Germany, Federal Republic of	18 Sept. 1973
Ghana	8 Mar. 1957
Greece*	25 Oct. 1945
Grenada	17 Sept. 1974
Guatemala*	21 Nov. 1945
Guinea	12 Dec. 1958
Guinea-Bissau	17 Sept. 1974
Guyana	20 Sept. 1966
Haiti*	24 Oct. 1945
Hondures*	17 Dec. 1945
Hungary	14 Dec. 1955
Iceland	19 Dec. 1946
India*	30 Oct. 1945

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† Formerly Dahomey

‡ By resolution 2758 (XXVI) of 25 Oct 1971 the General Assembly decided "to restore all its rights to the People's Republic of China and to recognize the representatives of its Government as the only legitimate representatives of China to the United Nations, and to expel forthwith the representatives of Chiang Kai-shek from the place which they unlawfully occupy at the United Nations and in all the organizations related to it".

¶ Formerly Cambodia

Indonesia‡	28	Sept.	1950
Iran*	24	Oct.	1945
Iraq*	21	Dec.	1945
Ireland	14	Dec.	1955
Israel	11	May	1949
Italy	14	Dec.	1955
Ivory Coast	20	Sept.	1960
Jamaica	18	Sept.	1962
Japan	18	Dec.	1956
Jordan	14	Dec.	1955
Kenya	16	Dec.	1963
Kuwait	14	May	1963
Lao People's Democratic Republic	14	Dec.	1955
Lebanon*	24	Oct.	1945
Lesotho	17	Oct.	1966
Liberia*	2	Nov.	1945
Libyan Arab Jamahiriya	14	Dec.	1955
Luxembourg*	24	Oct.	1945
Madagascar	20	Sept.	1960
Malawi	1	Dec.	1964
Malaysia**	17	Sept.	1957
Maldives	21	Sept.	1965
Mali	28	Sept.	1960
Malta	1	Dec.	1964
Mauritania	27	Oct.	1961
Mauritius	24	Apr.	1968
Mexico*	7	Nov.	1945
Mongolia	27	Oct.	1961
Morocco	12	Nov.	1956
Mozambique	16	Sept.	1975
Nepal	14	Dec.	1955
Netherlands*	10	Dec.	1945
New Zealand*	24	Oct.	1945
Nicaragua*	24	Oct.	1945
Niger	20	Sept.	1960
Nigeria	7	Oct.	1960
Norway*	27	Nov.	1945
Oman	7	Oct.	1971
Pakistan	30	Sept.	1947
Panama*	13	Nov.	1945
Papua New Guinea	10	Oct.	1975
Paraguay*	24	Oct.	1945
Peru*	31	Oct.	1945
Philippines*	24	Oct.	1945
Poland*	24	Oct.	1945
Portugal	14	Dec.	1955
Qatar	21	Sept.	1971
Romania	14	Dec.	1955
Rwanda	18	Sept.	1962
Saint Lucia	**18**	**Sept.**	**1979**
Saint Vincent and the Granadines	16	Sept.	1980
Samoa	15	Dec.	1976
Sao Tome and Principe	16	Sept	1975
Saudi Arabia*	24	Oct	1945
Senegal	28	Sept	1960
Seychelles	21	Sept	1976
Sierra Leone	27	Sept.	1961
Singapore	21	Sept	1965
Solomon Islands	19	Sept	1973
Somalia	20	Sept	1960
South Africa*	7	Nov.	1945
Spain	14	Dec	1955
Sri Lanka	14	Dec	1955
Sudan	12	Nov.	1956
Surinam	4	Dec	1975
Swaziland	24	Sept	1968
Sweden	19	Nov	1946
Syrian Arab Republic*‡‡	24	Oct	1945
Thailand	16	Dec	1946
Togo	20	Sept.	1960
Trinidad and Tobago	18	Sept	1962
Tunisia	12	Nov.	1956
Turkey	24	Oct.	1945
Uganda	25	Oct	1962
Ukrainian Soviet Socialist Republic*	24	Oct	1945
Union of Soviet Socialist Republic*	24	Oct.	1945
United Arab Emirates	9	Dec	1971
United Kingdom of Great Britain and Northern Ireland	24	Oct	1945
United Republic of Cameroon	20	Sept	1960
United Republic of Tanzania††	14	Dec.	1961

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‡ By letter of 20 January 1965. Indonesia announced its decision to withdraw from the United Nations "at this stage and under the present circumstances" By telegram of 19 Sept. 1966, it announced its decision "to resume full co-operation with the United Nations and to resume participation in its activities" On 28 Sept 1966 the General Assembly took note of this decision and the President invited the representatives of Indonesia to take seats in the Assembly

** The Federation of Malaya joined the United Nations on 17 Sept. 1957. On 16 Sept. 1963, its name changed to Malaysia following the admission to the new federation of Singapore, Sabah (North Borneo) and Sarawak. Singapore became an independent State on 9 August 1965 and a United Nations Member on 21 Sept 1965

‡‡ Egypt and Syria were original Members of the United Nations from 24 Oct. 1945. Following a plebiscite on 21 Feb 1958 the United Arab Republic was established by a union of Egypt and Syria and continued as a single Member On 13 Oct. 1961, Syria resumed its status as an independent State and simultaneously its United Nations membership On 2 Sept 1971, the United Arab Republic changed its name to Arab Republic of Egypt.

†† Tanganyika was a United Nations Member from 14 Dec. 1961, Zanzibar was a Member from 16 Dec 1963 Following the ratification on 26 April 1964 of Articles of Union between Tanganyika and Zanzibar the United Republic of Tanganyika and Zanzibar continued as a single Member changing its name to United Republic of Tanzania on 1 November, 1964.

United States of America[*]	24 Oct. 1945
Upper Volta	20 Sept. 1960
Uruguay[*]	18 Dec. 1945
Vanuatu	15 Sept. 1981
Venezuela[*]	15 Nov. 1945
Viet Nam	20 Sept. 1977
Yemen	30 Sept. 1947
Yugoslavia[*]	24 Oct. 1945
Zaire	20 Sept. 1960
Zambia	1 Dec. 1964
Zimbabwe	25 Aug. 1980

Secretariat. The Secretariat is headed by the Secretary General who is the chief administrative officer of the UN. He is assisted by an international staff appointed by him. The Secretary General makes an annual report to the General Assembly and such other reports as may be necessary from time to time. He can also bring to the notice of the Security Council any matter which in his opinion threatens international peace. He executes all resolutions passed by the General Assembly and the Security Council and exercises general supervision over the activities of associate agencies.

Secretary General. Javier Perez de Cuellar of Peru succeeded Dr. Kurt Waldheim as Secretary General on 1st January, 1982.

The Security Council. The Security Council consists of 15 members[‡]; five permanent members, viz. China, France, USSR, UK and USA and ten non-permanent members elected by the General Assembly by a two-thirds majority. The Council functions continuously. Its presidency is held for one month in rotation by representatives of member states in the English alphabetical order of their names. On all matters, other than procedure, decisions are to be made on the strength of 9 affirmative votes, which should include the concurrent votes of the 5 permanent members. Any permanent member can veto any decision of the Security Council. The Council has two standing committees, one of experts, and the other for admission of new members and a permanent Disarmament Commission

The ten non-permanent members of the Security Council are to be elected on the following basis: 5 members from African and Asian countries, 2 from Latin American countries, 2 from Western European countries and "others" (others mainly imply Commonwealth countries) and 1 from East European countries.

The present composition (Sept 1980) of the Security Council is as follows: Permanent members—China, France, Soviet Union, United Kingdom and the United States; non-permanent members—Bangladesh, German Dem. Rep., Jamaica, Mexico, Niger, the Philippines, Norway, Portugal, Tunisia, and Zambia.

The Trusteeship Council looks after the interests of people in areas which are not yet fully self-governing. Such areas may be territories formerly held under the League of Nations mandate or territories taken from enemy states in World War II or territories voluntarily placed under trusteeship by states responsible for their administration. The Council consists of member states administering Trust Territories, the permanent members of the Security Council who do not administer Trust Territories and such number of elected representatives as would equalise the number of members administering Trust Territories. The elected members function for a period of three years. Retiring members are eligible for re-election. The Council meets at least once a year. The President is elected for one year and is not immediately eligible for re-election.

ECOSOC. *The Economic and Social Council* (ECOSOC) is responsible under the General Assembly for carrying out the objects of UNO in international economic, social, cultural, health and other allied matters. The Council can act in concert with inter-governmental agencies, international non-governmental organizations and (after consultation with the member state concerned) with national organizations working in these fields. The Council originally consisted of one delegate each from 18 member states elected by a two-thirds majority of the General Assembly, six members being elected each year for a 3-year term. It now consists of 54 members, elected for a three-year tenure. One-third of the members (18) retire annually but are eligible for re-election

The Council elects member states to the following commissions which function under it

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[*] Original Member

[‡] By an amendment of the UN Charter on Aug. 31, 1964

1. Transport and Communications Commission
2. Statistical Commission
3. Social Commission
4. Population Commission
5. Commission on Narcotic Drugs
6. Commission on Human Rights
7. Commission on Status of Women
8. International Trade Commodity Commission
9. Economic Commission for Europe (ECE)
10. Economic and Social Commission for Asia and the Pacific (ESCAP)†
11. Economic Commission for Latin America (ECLA)
12. Economic Commission for Africa (ECA).

Representatives on these Commissions, except the Commission on Narcotic Drugs, are nominated by the elected states, in consultation with the Secretary General, so as to secure a balanced representation in the various spheres covered by the different commissions. Representatives in the Narcotics Commission are nominated directly by the states elected to that Commission. All these nominations are to be ratified by the Council.

The International Court of Justice was created by an international treaty, the Statute of the Court, which forms part of the UN Charter. The Court has fifteen judges, no two of whom may be nationals of the same state. The judges are elected by the General Assembly and the Security Council sitting independently. Their term of office is 9 years, but they are eligible for re-election. The Court elects its own President and Vice-Presidents for a term of 3 years. The full Court of Judges usually sits but a quorum of 9 judges is sufficient to constitute the Court. The Court exercises jurisdiction in all matters referred to it by member states.

All questions are decided by a majority of judges present. If there is no judge on the bench, belonging to the nationality of the parties to the dispute, each party has the right to choose a judge, who shall sit with the other judges.

The permanent seat of the Court is at The Hague (Netherlands) but it may sit elsewhere whenever it considers this desirable. The official languages of the Court are English and French.

(ii) AUXILIARY AGENCIES

All members of the UN are not members of the Auxiliary Agencies. Some agencies like the UPU have non-UN members. Member States of Auxiliary agencies include nominal members, *de facto* members and associate members.

The Food and Agricultural Organisation (FAO) came into being in 1945. It is administered by a General Conference of one representative from each member state, a Council of 27 elected by the Conference and a Director General. Its main functions are to review food and agricultural conditions the world over, to improve production, to introduce higher standards of nutrition and standards of living, to conserve natural resources, to suggest improvements in land tenure and to provide agricultural credit. *Headquarters:* Rome, Italy. *Members:* 147.

The General Agreement on Tariffs and Trade (GATT) is an offshoot of a projected scheme for an International Trade Organisation (ITO) sponsored by the UN. The scheme was based on the Havana Charter, drawn up by a preparatory committee of the UN Economic and Social Council in 1947. The Havana Charter was not favourably received by some states of the UN particularly by USA. Therefore, the member states of the preparatory committee, 23 in number, concluded a general agreement among themselves at Geneva in 1947. This agreement known as the General Agreement on Tariffs and Trade (GATT) came into force in 1948. On the whole, the GATT now controls more than 80 per cent of the world's trade

The GATT is based on the most-favoured nation principle. The GATT members extended to one another special privileges and concessions in trade which they do not accord to other states. The main work of GATT is to minimise trade barriers by the progressive reduction of tariffs and other restrictions on trade among themselves. Much leeway is, however, allowed to members who have trade commitments with countries outside the Agreement. In 1955 the GATT countries made a comprehensive review of the working of the agreement. They drew up a constitution for a permanent organisation known as the Organisation for Trade Co-operation (OTC). The OTC is the executive agency of the GATT. *Headquarters:* Geneva, Switzerland. *Members:* 85.

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† Originally named Economic Commission for Asia and the Far East (ECAFE)

The International Atomic Energy Agency (IAEA) was organised in 1957. It is administered by a board of 25 governors with a Director-General. Its main object is to use atomic energy for peaceful purposes. *Headquarters:* Vienna, Austria. *Members:* 110.

World Bank

The International Bank for Reconstruction and Development (IBRD), known shortly as the *World Bank,* started functioning in 1946. Its purpose is to encourage international investment for increasing production, raising living standards and securing better balances in international trade. The bank gives loans to member states for specific projects like reconstruction, electric power, transportation, agriculture or communications. *Headquarters:* Washington DC., USA. *Members:* 139.

The International Finance Corporation (IFC) came into existence on July 24, 1956, as an affiliate of the International Bank for Reconstruction and Development. Its object is the economic development of less developed states by providing capital for productive enterprises in association with private investors. It is an investing rather than a lending institution. *Headquarters:* Washington DC., USA. *Members:* 118.

The International Development Association (IDA) came into existence in Sept. 1960. It is, like the IFC, an affiliate of the International Bank. It gives loans on terms more flexible than those for more conventional loans, for important development projects in underdeveloped countries, irrespective of whether the project so assisted is revenue-producing or directly productive. Thus IDA may help projects for water supply, sanitation and highways. *Headquarters:* Washington DC., *Members:* 125

The International Monetary Fund (IMF), known shortly as the Fund, was established in 1945. Every country has to become a member of the IMF first, before it can avail itself of the services of the World Bank. Its capital is subscribed by member states in the form of gold and national currencies. The purposes of the Fund are to promote international monetary co-operation, maintain exchange stability, remove exchange restrictions and facilitate world trade. The Fund co-operates with member governments fixing the exchange values of their currencies in gold or US dollars. Any change by more than 10 per cent is to be approved by the Fund. The work of the Fund is controlled by a Board of Governors, on which all member states are represented.

Now that exchange values are no longer determined in terms of gold the IMF has ceased to have any impact on foreign exchange. However, it sells currency to members who are in temporary difficulties for foreign exchange. *Headquarters:* Washington DC., *Members:* 141.

International Fund for Agricultural Development (IFAD) was established on Nov. 30, 1977 as a new agency within the UN system. The object of the Fund is to mobilise additional resources to be made available on concessional terms for agricultural development in developing member states.

The poor countries will have first priority in all IFAD operations. IFAD will finance projects in all developing countries, but statutorily it must give top attention to the poorest among them. Projects financed by the Fund in the middle-income developing world will have to be undertaken to benefit primarily the poorer rural class.

The Fund was set up to help finance, largely through soft loans, food production and rural development in the "have-not" countries of the world. *Headquarters:* Rome, Italy. *Members:* 135.

The International Civil Aviation Organisation (ICAO) was inaugurated in 1947. This organisation superseded two previous international agreements on civil aviation, viz. the Paris Convention of 1919 and the Pan American Convention of 1928. Its purpose is to assist international aviation by providing uniform regulations for operation, simpler procedures at borders, improvements in technical methods and equipment and better safety for passengers

Headquarters: Montreal, Canada. *Members:* 146.

The International Labour Organisation (ILO) came into existence as a subsidiary of the League of Nations in 1919. It is composed of the representatives of governments, employers and workers. Its objects are to improve labour conditions, to raise living standards, and generally to promote economic and social stability in all member states. The UN recognised it as one of its associate agencies in 1946. The ILO is administered by an International Labour Conference which meets annually, a Governing Body and the International Labour Office. The Governing Body consists of 48 members, of whom 24 are government representatives, 12 representatives of employers and 12 of workers. They are elected for a term of three years by their respective representatives in the conference. Ten governments, *viz.*, Canada, China, France, West Germany, India, Italy, Japan, USSR, UK and USA have permanent seats on the Board. The others are elected. *Headquarters:* Lausanne, Geneva, Switzerland. *Members:* 144.

The Inter-governmental Maritime Consultative Organisation (IMCO) was formed in 1959. It provides a machinery for co-operation between governments in maritime regulations and practices and seeks to abolish discriminatory action by national maritime authorities and unfair practices by shipping concerns. It has an Assembly of all member states, which meets once in 2 years, a Council composed of 16 members and a Secretariat under a Secretary General. *Headquarters:* London. *Members:* 113.

The International Telecommunications Union (ITU) was formed in 1932 by the merger of the International Telegraph Union, founded in Paris in 1865 and the International Radio-Telegraph Union founded in Berlin in 1906. In 1947 a plenipotentiary conference in Atlantic City effected radical changes in the organisation and the UN recognised it as one of its agencies. The ITU allocates radio frequencies and registers radio frequency assignments, makes studies and recommendations and collects and publishes information for the benefit of its members. *Headquarters:* Geneva, Switzerland. *Members:* 154.

International Telecommunications Satellite Consortium (INTELSAT) was founded in 1964 for the establishment of a global commercial communications satellite system. Definite agreements were signed in May 1971. Membership of INTELSAT is open to all states who are members of the ITU (International Telecommunications Union).

United Nations Environment Programme (UNEP). The first-ever international conference on the protection and conservation of the Human Environment was convened by the United Nations in Stockholm in June 1972. On the basis of a Conference recommendation, UNEP was established to assist countries in the protection of the natural environment and to prevent air pollution, soil degradation, desertification etc. On the recommendation of the UNEP Governing Council, a *UN Habitat and Human Settlements Foundation* was established in Jan. 1975. UNEP is also developing a *Global Environmental Monitoring System. Headquarters:* Nairobi, Kenya.

The United Nations Conference on Trade and Development (UNCTAD) was set up as a subsidiary organ of the UN by a resolution adopted in December, 1964. The principal aim of UNCTAD is to promote international trade, so as to accelerate the economic growth of underdeveloped countries and bring them into line with the advanced countries. The Conference is convened at intervals of not more than three years.

The chief executive of the conference is the *Trade and Development Board* which meets at least twice a year. The Board comprises 55 members representing 55 states elected by the conference to the Board.

The UNCTAD, for long a futile organisation, has now become important in the context of the New Economic Order. It has become the lead institution for formulating international policies and measures to deal with the special problems of the undeveloped and developing countries and has also assumed the principal role at the international level in promoting economic co-operation among developing countries. *Headquarters:* Geneva, Switzerland.

The United Nations Educational Scientific and Cultural Organisation (UNESCO) was started in 1945. Its main purpose is to contribute to peace and security by promoting collaboration among nations through education, science and culture. The educational programme includes extension and improvement of education and the establishment of training centres for teachers in different countries. In science the organisation promotes the work of international scientific institutions and arranges meetings of international scientists. On the cultural side, the organisation tries to improve the quality of the press, the film and radio services throughout the world. UNESCO is controlled by a General Conference consisting of the representatives of member states, an Executive Board of 24 elected by the Conference and a Director General. *Headquarters:* Paris, France. *Members:* 153.

United Nations Industrial Development Organisation (UNIDO) came into being in January 1967, as a result of a resolution adopted two months earlier by the United Nations General Assembly "to promote and accelerate the industrialisation of the developing countries". It was given the central role in co-ordinating all the activities undertaken by the United Nations family in this field.

The new constitution of the United Nations Industrial Development Organisation (UNIDO), establishing it as a specialised agency, had been signed by 98 countries till the end of 1980 and ratified by 26 countries, including India. It will come into force when a minimum of eighty countries ratify the constitution adopted in April 1979 at Vienna.

The constitution states that the primary objective of UNIDO is to promote industrial development in the developing countries with a view to assisting the establishment of a new international economic order.

Under the constitution, UNIDO will have three organs, the general conference usually scheduled to meet once in two years, the industrial development board with 53 members (33 from developing nations and 15 from industrialised states and five from socialist countries) and a secretariat headed by a director-general *Headquarters:* Vienna, Austria.

The United Nations High Commissioner for Refugees (UNHCR) was established by the General Assembly in January 1951. The work of the office of UNHCR is of a humanitarian and non-political nature. The office promotes, organises and co-ordinates international action on behalf of those refugees, who require international help. It provides international protection and material assistance for repatriation, resettlement or rehabilitation. *Headquarters:* Geneva, Switzerland.

The United Nations Children's Fund (UNICEF) was originally established by the General Assembly of the UN in 1946, to give aid to child victims of war and for improving child health in war-blasted countries. It was an emergency measure and was called the International Children's Emergency Fund; hence UNICEF. In 1950, the programme was extended to children in under-developed countries. In 1953, it became a permanent organisation. It has so far helped more than 116 countries in child and maternal care programmes. It functions under an Executive Board of 30 member states, designated by the Economic and Social Council. The resources of UNICEF consist of voluntary contributions, both governmental and private. *Headquarters:* New York, USA.

The Universal Postal Union (UPU) was known as the General Postal Union when it was first formed in 1874. In 1948, UPU became a specialised agency of the UNO. Its purpose is to facilitate international postal service. The member states of the Union which includes almost all the independent nations and self-governing territories under the UN are united in a single postal territory for exchange of correspondence. The UPU is composed of a Universal Postal Congress which meets every 5 years and an International Bureau which functions as the permanent secretariat. *Headquarters:* Berne, Switzerland. *Members:* 160.

The World Health Organisation (WHO) was constituted in 1948. Its object, broadly, is the attainment by all peoples of the world, of the highest possible level of health. Its activities comprise eradication of diseases, prevention of epidemics, improvement of nutrition, dissemination of hygienic habits and other positive measures to ensure healthier living in all countries.

The organisation is made up of a World Health Assembly, representing all member states, an Executive Board of 24 elected by the Assembly and a Director General. *Headquarters:* Geneva, Switzerland. *Regional offices:* Brazzaville, Washington, New Delhi, Copenhagen, Alexandria and Manila. *Members:* 152.

World Intellectual Property Organisation (WIPO) was established in its present form in 1967 to assist the promotion and protection of intellectual property throughout the world. WIPO encourages the conclusion of pertinent international treaties and the harmonization of national legislation. It gives legal and technical assistance and renders a variety of other services. *Headquarters:* Geneva, Switzerland. *Members:* 88.

The World Meteorological Organisation (WMO) came into existence in 1951 as a result of the deliberations of the Directors of the International Meteorological Organisation (founded in 1878) who met in Washington in 1947. Its purposes are to facilitate exchange of weather data, to establish a world-wide network of meteorological stations and to encourage research and training in meteorology. It consists of a World Meteorological Congress, an Executive Committee, a President, two Vice-Presidents and a permanent secretariat. *Headquarters:* Geneva, Switzerland. *Members:* 150.

(iii) OTHER ORGANISATIONS

Note: Organisations listed below are not UN Agencies.

The Asian Development Bank (ADB) was initially sponsored by the ECAFE and started functioning in 1966. All powers of the Bank are vested in a Board of Governors, who delegate their powers to a Board of Directors for the day to day administration of the Bank. In 1975, ADB had 27 regional members and 14 non-regional members.

In June 1974, ADB launched the Asian Development Fund (ADF) with a view to providing concessional credits to needy members. The initial capital required is estimated at 525 million dollars, out of which 210 million will be contributed by Japan, Australia and New Zealand, the three affluent regional members, and the balance will be provided by the 14 non-regional members. *Headquarters:* Manila, Philippines

The League of Arab States or the Arab League is the outcome of a national awakening of the Arabs, following the fall of the Ottoman Empire in the First World War. A non-official National Arab Conference was held in Jerusalem on Dec. 13, 1931. It unanimously affirmed the long cherished goals of Arab unity and independence in what is known as the Arab Covenant. A preparatory meeting of the General Arab Conference was inaugurated in Alexandria in Sept. 1944. This was attended by representatives from Egypt, Syria, Iraq, Lebanon, Jordan, Saudi Arabia and Palestine. After prolonged discussions the Conference adopted a charter in Oct. 1944. The Arab League was formally instituted on March 22, 1945.

The Arab League consists of a Council, a Secretary General and a few permanent committees.

The League Council, like the General Assembly of the United Nations, is the main body of the League in which all the member states are represented.

In July 1977 the following states were members of the League: Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Somalia, Syria, Tunisia, United Arab Emirates, Yemen (North) and Yemen (South). *Headquarters:* Tunis, Tunisia.

The Association of South East Asian Nations (ASEAN) was established in 1967 at Bangkok, Thailand, to accelerate economic progress and maintain the economic stability of South East Asia. ASEAN replaces ASA (Association of South-East Asia) which was composed of Malaysia, the Philippines and Thailand. The present members of the ASEAN are Indonesia, Malaysia, the Philippines, Singapore and Thailand. The supreme body of the ASEAN is the Ministerial Conference of the Foreign Ministers of member States. Day to day operations are looked after by a Standing Committee formed by the Conference. *Headquarters:* Bangkok, Thailand.

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The Central Treaty Organisation (CENTO) was originally known as the Baghdad Pact which was signed by Turkey and Iraq in 1955. In 1959 USA joined the Pact along with Iran and Pakistan. The new arrangement was known as the Central Treaty Organisation. Iran withdrew soon after it was formed. Pakistan became indifferent some time after. The Cento is now as good as dead. *Headquarters:* Turkey.

The Colombo Plan for co-operative economic development in South & South-East Asia, was initiated by the British Commonwealth of Nations in 1950. Subsequently, South East Asian countries, Japan and USA joined the plan. The members at present are Afghanistan, Bhutan, Burma, Sri Lanka, India, Indonesia, Iran, Korea (South), Malaysia, Maldives, Nepal, Pakistan, the Philippines, Singapore and Thailand. Members outside the region are: Australia, Canada, Japan, New-Zealand, UK and USA. The Consultative Committee made up of the Ministers of member countries constitutes the highest body in the Plan. It is assisted by a council for Technical Co-operation consisting of representatives of member states, which serves as the real executive body of the Plan. *Headquarters:* 12, Melbourne Avenue, P.O. Box 596, Colombo, Sri Lanka.

*The Council of Mutual Economic Assistance** was founded in 1949 to assist the economic development of its member states through joint utilisation and co-ordination of resources. The members are Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, USSR and the Mongolian People's Republic. The Mongolian People's Republic was admitted in 1962. Albania, one of the original members, withdrew in 1961. *Headquarters:* Moscow, USSR.

The Commonwealth of Nations. The idea of a Commonwealth of Nations comprising Great Britain, the Dominions and other Territories in the British Empire, was first accepted at the Imperial Conference of 1926. In 1931 the Statute of Westminister recognised the status of the Dominions and defined the relations of the British Crown to the Dominions. The other territories were entitled to become members of the Commonwealth on attaining full self-government. In 1947, the office of the Secretary of State for Dominions was abolished and the Secretary of Commonwealth Relations assumed charge.

The Commonwealth has no written constitution which regulates its functions. Its members are autonomous countries associated with Britain, equal in status, in no way subordinate to one another in any aspect of their domestic or foreign affairs, though united by a common allegiance to the Crown, and freely associated as members of the British Commonwealth of Nations.

Some of the members like Canada, Australia and New Zealand recognise the Queen as the titual head of their States and have Governors-General appointed by the Queen on the recommendation of the State Cabinets. Some like India and Sri Lanka, who have elected Presidents of their own as Heads of State, recognise the Queen as the Head of the Commonwealth only.

Members of the Commonwealth are represented in other Commonwealth countries by diplomatic officers called High Commissioners in the place of Ambassadors representing non-Commonwealth countries.

Britain's entry into the European Economic Community or the European Common Market in 1972 has not altered the relations of Britain with the Commonwealth countries, while it has increased the opportunities of Commonwealth countries to negotiate advantageous commercial agreements with the EEC. India, Sri Lanka and Bangladesh have already established co-operative commercial agreements with the Community

The present member countries of the Commonwealth (1981) are as follows

Australia, Bahamas, Bangladesh Barbados, Botswana Britain, Canada Cyprus, Dominica, Fiji, The Gambia Ghana, Grenada, Guyana, India, Jamaica, Kenya, Kiribati, Lesotho Malawi, Malaysia, Malta, Mauritius Nauru, New Zealand, Nigeria, Papua New Guinea, Saint Lucia St Vincent Seychelles, Sierra Leone, Singapore Solomon Islands Sri Lanka, Swaziland Tanzania Tonga, Trinidad and Tobago Tuvalu, Uganda, Vanuatu Western Samoa Zambia and Zimbabwe *Headquarters* Marlborough House, Pall Mall

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* Also known as COMECON

London, SWIY 5 HX.

The Council of Europe was set up in May 1949 by the foreign ministers of Belgium, Denmark, France, Irish Republic, Italy, Luxembourg, the Netherlands, Norway, Sweden and UK. Turkey and Greece jointed the Council in July, 1949. Iceland became a member in 1950. The Federal Republic of Germany became a full member in 1951. Austria joined in 1956, Cyprus in 1961, Switzerland in 1963 and Malta in 1965.

The objects of the Council are to achieve a greater unity among its members, regarding the ideals of democracy believed in by them and to facilitate economic and social progress of the member countries.

The main organs of the Council are: (i) The Committee of Ministers consisting of the foreign ministers of the member governments. (ii) The Consultative Assembly, which now consists of 144 members representing the legislatures of the member countries in fixed proportions. The Committee of Ministers is the executive authority, while the Consultative Assembly is the deliberative body. The Assembly meets once a year. The official languages of the Council are English and French. *Headquarters:* Strasbourg, France.

The East African Common Services Organisation (EACSO) was formed in 1961 by 3 East African states. The organisation is controlled by the heads of the three states, the President of Tanzania, and the Prime Ministers of Uganda and Kenya. These form the East African Common Services Authority and constitute the highest policy-making body.

The Organisation is planning to form an East African Common Market on the lines of the European Common Market. *Headquarters:* Nairobi.

The European Coal and Steel Community (ECSC) was created in pursuance of a treaty signed by six countries of Europe, in Paris in 1951. The countries were: France, Belgium, the Netherlands, Luxembourg, Federal Republic of Germany and Italy. The treaty affirmed a closer political union of the six countries and created a common market for coal, iron and steel

European Economic Community (ECC) or *European Common Market (ECM).* The EEC, now commonly known as the European Common Market (ECM) was brought into existence by the Treaty of Rome, signed by the six countries of ECSC in 1957. Its main task is to integrate the economics of the six member countries for a specified period (10 to 15 years). The primary agency for this integration is a common market for all commodities except coal and steel already provided by ECSC. The EEC aims at a progressive reduction and the ultimate abolition of all tariffs and the free import and export of commodities among member states and the unrestricted movement of labour and capital among them. It has also established a European Investment Bank, to help less developed countries in Europe.

A Council of Ministers consisting of one member from each government takes decisions on common questions and lays down common policies. The general body of the Community is the Assembly of 142 members elected from member states in agreed proportions. The Assembly exercises general control over the work of the ECSC, EEC and EURATOM.

Expansion of the EEC. On 22nd January 1972, Britain, Ireland, Denmark and Norway signed the treaty of accession to the EEC at Egmont Palace, Brussels. The accession was subject to ratification by a referendum, in the case of Denmark and Norway. In Sept. 1972, the Norwegian referendum repudiated the accession and Norway ceased to be a member of the EEC. Denmark, however, ratified the accession by a referendum in Oct. 1972. Thus EEC now consists of 9 countries instead of ten.

In order to accommodate the European nations, who remain outside the EEC, an agreement was signed at Brussels in July 1972 between the nine countries of the EEC and the six members of the EFTA. This agreement created a new organisation, the European Free Trade Area, with effect from Jan. 1973 (See EFTA). *Headquarters:* Brussels.

The European Free Trade Association (EFTA) was formed in 1960, as the result of a convention signed by seven countries of Europe at Stockholm. The countries were UK, Austria, Denmark, Norway, Sweden, Switzerland and Portugal. This Association was formed on the pattern of the EEC and has the same objectives. The seven countries who formed the EFTA were generally called the Outer Seven, in contradistinction to the six countries of the EEC, who were called the Inner Six.

The original intention of the EFTA was not to provide a competitive organisation to the EEC, but to create a purely economic body, without the political commitments of the EEC.

The formation of the European Free Trade Area (see EEC) has provided common ground for economic co-operation among fifteen European countries—Belgium, France, Germany (West), Italy, Luxembourg, the Netherlands (original six of EEC), Denmark, Ireland, UK (who joined the EEC in 1972), Austria, Iceland, Norway, Portugal, Sweden, and Switzerland (the remaining members of the EFTA).

The old EFTA (European Free Trade Association) has become the new EFTA (European Free Trade Area). The 15-nation EFTA envisages a five-year programme to eliminate almost all industrial tariffs among them without committing the non-EEC members to any political union.

The European Atomic Energy Community (EURATOM) was formed in pursuance of a treaty signed in Rome in 1957 by the six countries who formed the ECSC and the EEC. The work of the EURATOM is controlled by the same organs as those of the EEC. But the executive powers are vested in a commission of 5 members nominated by the Council of Ministers and advised by a Scientific and Technical Committee of 20 members and an Economic and Social Committee of 101 members. All major decisions are, however, taken by the Council of Ministers which is formed of one minister from each member state. The object of the EURATOM is the development of nuclear energy for peaceful purposes. *Headquarters:* Brussels, Belgium.

The European Parliament is composed of 142 parliamentary representatives from the six countries of Europe who are signatories to the Treaty of Paris (1951) which formed the ECSC and the Treaty of Rome (1957) which formed the EEC and the EURATOM. The delegates to the parliament are elected by the respective legislatures of the member countries in fixed proportions. *Head quarters:* Luxembourg.

The European Space Research Organisation (ESRO) was formally established in 1964 to promote collaboration among European States, in space research and technology exclusively for peaceful purposes. The members are Belgium, Denmark, France, West Germany, Italy, the Netherlands, Spain, Sweden, Switzerland and UK. Austria, Ireland and Norway participate as observers.

The Council, consisting of two delegates from each member state, takes the major financial decisions. The actual executive is the Director-General, assisted by a Directorate. *Headquarters:* Paris, France.

The French Community is an organisation like the British Commonwealth. It offers to the French overseas territories, which manifest their will to adhere to it, new institutions based on the common idea of liberty, equality and fraternity and conceived with a view to their democratic evolution. This principle was accepted and promulgated by the Constitution of the (Fifth) French Republic which came into force in 1953.

Under the Constitution, the territories under French administration are given 3 choices: (1) They may keep their dependent status. (2) They may become overseas departments, under a prefect, with an elected council for territory and with the right to send representatives to the National Assembly and the Senate of the French Republic. (3) They may become member states of the Community with full internal autonomy, but their foreign affairs, defence, currency, transport, telecommunications and such other common affairs will be controlled by the Senate which is the supreme deliberative body of the Community. The Senate consists of 284 members 186 of whom represent the French Republic and the rest the representatives of the overseas legislatures of member states. By an amendment of the Constitution in 1960, member states may become fully independent and sovereign republics without ceasing to belong to the Community. Many African states availed themselves of this opportunity and have assumed sovereign status

Members. Independent members of the Community are: 1. French Republic, 2. Central African Republic, 3. Republic of Congo, 4. Gabon, 5. Senegal, 6. Chad, 7. Madagascar, 8. Djibouti.

The International Air Transport Association (IATA) was founded in 1945 to promote safe, regular and economical air transport and to provide a forum for collaboration. At present there are 40 international airlines (active members) and 19 domestic airlines (associate members).

The Annual General Meeting is the ultimate authority in the Association. The Executive Committee consists of 18 elected members. *Headquarters:* Montreal, Canada and Geneva, Switzerland.

The North Atlantic Treaty Organisation (NATO). In 1949 the foreign ministers of Belgium, France, Luxembourg, the Netherlands, UK, Canada, Denmark, Iceland, Italy, Norway, Portugal and USA met in Washington and signed the North Atlantic Treaty. Greece and Turkey joined the Treaty in 1951 and the Federal Republic of Germany in 1954. Thus NATO is an organisation made up of 12 European states, two American states (Canada and USA) and an Asiatic state (Turkey).

The Council is the supreme body of the NATO. It consists of the ministers of member states. The Secretary General is appointed by and responsible to the Council. The Military Committee is the supreme military body of NATO. It consists of the Chiefs of Staff of member states. In 1966 France withdrew from the Military Committee while remaining a member of the Council. *Headquarters:* Brussels, Belgium.

The Organisation of American States (OAS). The Charter of the OAS was adopted in April 1948, at the ninth International Conference of American States at Bogota, Colombia. The OAS has absorbed previous Inter-American organisations like the Pan American Union. The OAS is practically a regional agency of the UNO in the western hemisphere and is intended to promote mutual understanding and help among American countries.

Twenty-two American countries are members of the organisation, with equal rights, each country possessing one vote. The members are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Trinidad and Tobago, Venezuela and USA. In Jan. 1962 Cuba was excluded from the OAS at a special meeting held at Punta del Este, Uruguay.

Inter-American Conference is the supreme policy-making body of the OAS. It meets once in 5 years. The Pan-American Union, is the central organ and general secretariat of the Organisation. The Secretary General and the Asst. Secretary General who head the Union, are elected by the Council for 10-year terms. *Headquarters:* Washington DC., USA.

The Organisation of African Unity (OAU) came into being in May 1963, when the heads of 30 African States met at Addis Ababa and signed a charter establishing a common organisation for all African states.

Its chief objects are unity and solidarity among African States, elimination of colonialism and defence of the independence of member states. The supreme body in the OAU is the Conference of Heads of States or Governments. The official languages of the organisation are French and English in addition to all the native African languages.

The organisation has at present 41 member-states.

Headquarters: African Unity House, Addis Ababa, Ethiopia.

The Organisation Commune Africainent Malgache (OCAM) was originally formed as an organisation of French speaking colonies in Africa. When OAU was formed in 1963, OCAM agreed to sink their political individuality in the larger interests of Africa. But by 1965 most of the French-speaking states of Africa, had become irate at the policy of OAU. In February 1965, 13 French-speaking African republics met at Nouakchott, the capital of Mauritania, and decided to revive OCAM. President Boigny of the Ivory Coast was the leader of this revival movement. All French-speaking states except Guinea and Mali, have subscribed to the revived OCAM and the Republic of Zaire has become an active member of OCAM. *Headquarters:* Yaounde, Cameroon. *Members:* 14.

The Organisation for Economic Co-operation and Development (OECD) was formed in 1961 to replace the Organisation for European Economic Co-operation (OEEC) which was started immediately after the Second World War for the reconstruction of war-ravaged European states. The OEEC was formed in response to an offer of aid from the US Secretary of State, Marshall. This aid, since called the Marshall Aid, was to be used to rehabilitate the economies of European states ruined by the war. A conference of European states was held in Paris in 1948 to accept the proposal.

The OEEC changed its name in 1961 as OECD. The change indicates the altered status of the organisation. It is no longer a purely European organisation. USA and Canada have joined it as full members. This has made it an international organisation. The aims of the reconstituted organisation are to achieve the highest possible economic development in member countries and to raise the standard of living. The council consisting of the ministers of the member countries is the supreme body of the organisation. *Headquarters:* Paris, France. *Members:* 24.

The Organisation of Petroleum Exporting Countries (OPEC) was the culmination of a long drawn out tug of war between international oil companies and the petroleum exporting countries. Most of these companies were gigantic cartels controlling production in more than one state. It was in their option to increase or reduce petroleum production in various countries and to manipulate prices. Very often they played one producing country against another by adopting various devices that affected the economy of the producing states without reducing the companies' profits.

The immediate provocation for the formation of the OPEC was provided by the announcement of oil companies that they were reducing the prices of Middle East crude. This meant that the countries concerned would be losing proportionately. A conference called together at Baghdad in 1962 decided to form the OPEC. This conference was attended by the representatives of Iraq, Kuwait, Saudi Arabia (Arab Muslim states), Iran, a non-Arab but Muslim state, and Venezuela, a non-Arab, non-Muslim state in far away South America. These countries at that time controlled 80 per cent of the world oil trade.

The two main objectives of the OPEC are to protect the interests of the petroleum exporting countries and to eliminate cut-throat competition among themselves. By 1976 the OPEC had expanded to include 13 countries.

The South-East Asia Treaty Organisa-tion (SEATO) was signed at Manila on September 8, 1954, between Australia, France, New Zealand, Pakistan, Philippines, Thailand, UK and USA. It provided for the collective defence of South-East Asia and was primarily aimed against communist expansion-ism in Asia.

In Sept. 1975 the ministerial representatives of the existing SEATO countries (US, Great Britain, Australia, New Zealand, Philippines and Thailand) decided in the light of the new situation in South-East Asia to phase out the organisation. The SEATO has thus ceased to have any relevance in international matters.

The Warsaw Pact was signed in Warsaw in May 1955 between USSR, Albania (Albania has since left the Pact), Bulgaria, Czechoslovakia, East Germany, Hungary, Poland and Romania. It aimed at promoting the economic progress of the Pact states and safeguarding their security by collective action.

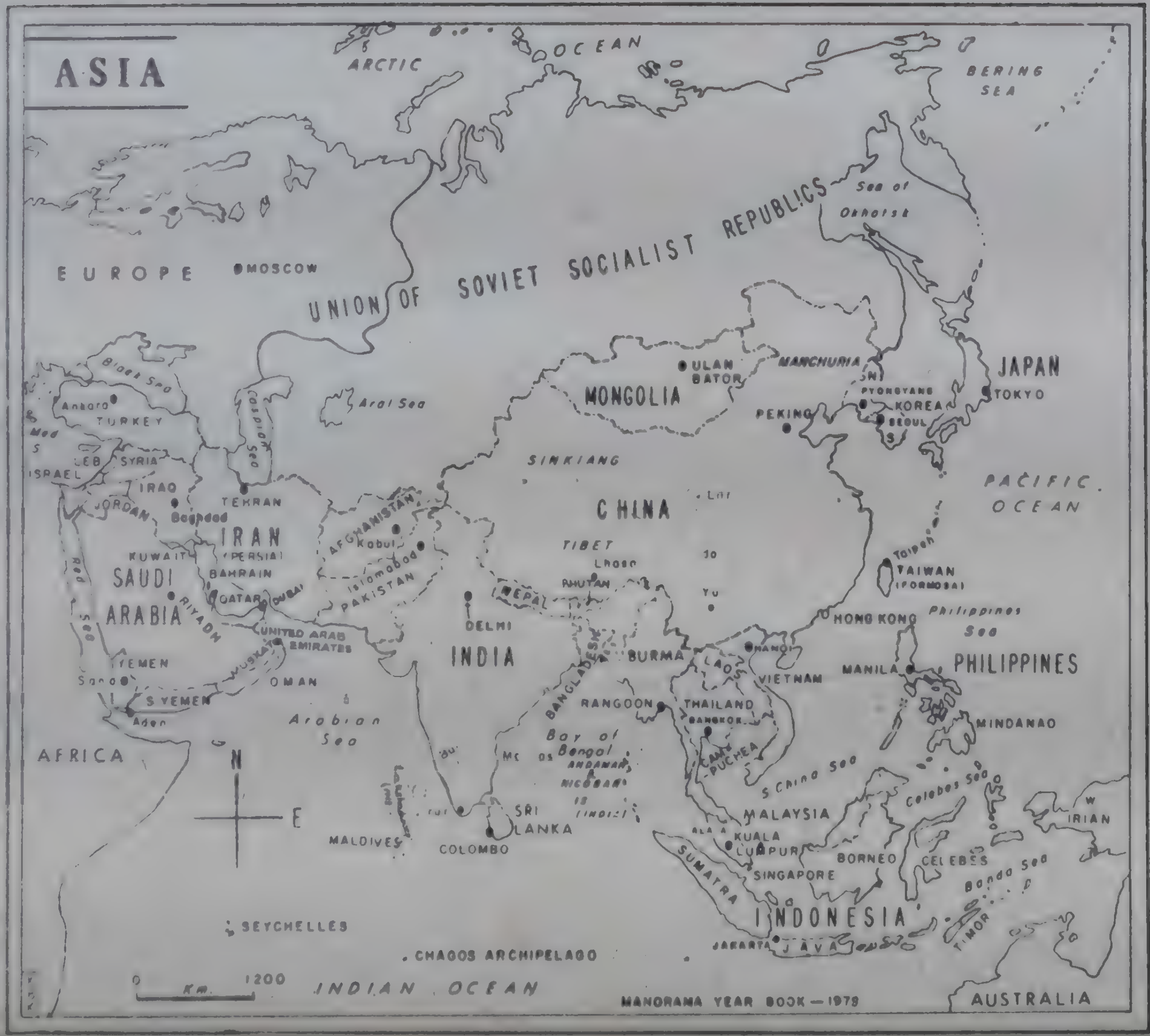
The Political Consultative Committee (PCC) is the supreme body of the organisation. It consists of the representatives of the Pact states. The Secretary General is the chief executive officer with his permanent headquarters in Moscow. *Headquarters:* Moscow, USSR.

Box 29

Unemployment in developed countries

NEW DELHI, (UNI). One out of every 12th person was unemployed in the industrialised countries by mid-1982 and there is no hope of early reversal of this trend, according to the International Monetary Fund. (IMF).

The worst hit by unemployment are the younger section of the labour force, immigrant workers and other minority groups. In France, the unemployment rate among workers under 25 years of age was 20 per cent in early 1982, compared with 13 per cent in 1979 and 4 per cent in 1973.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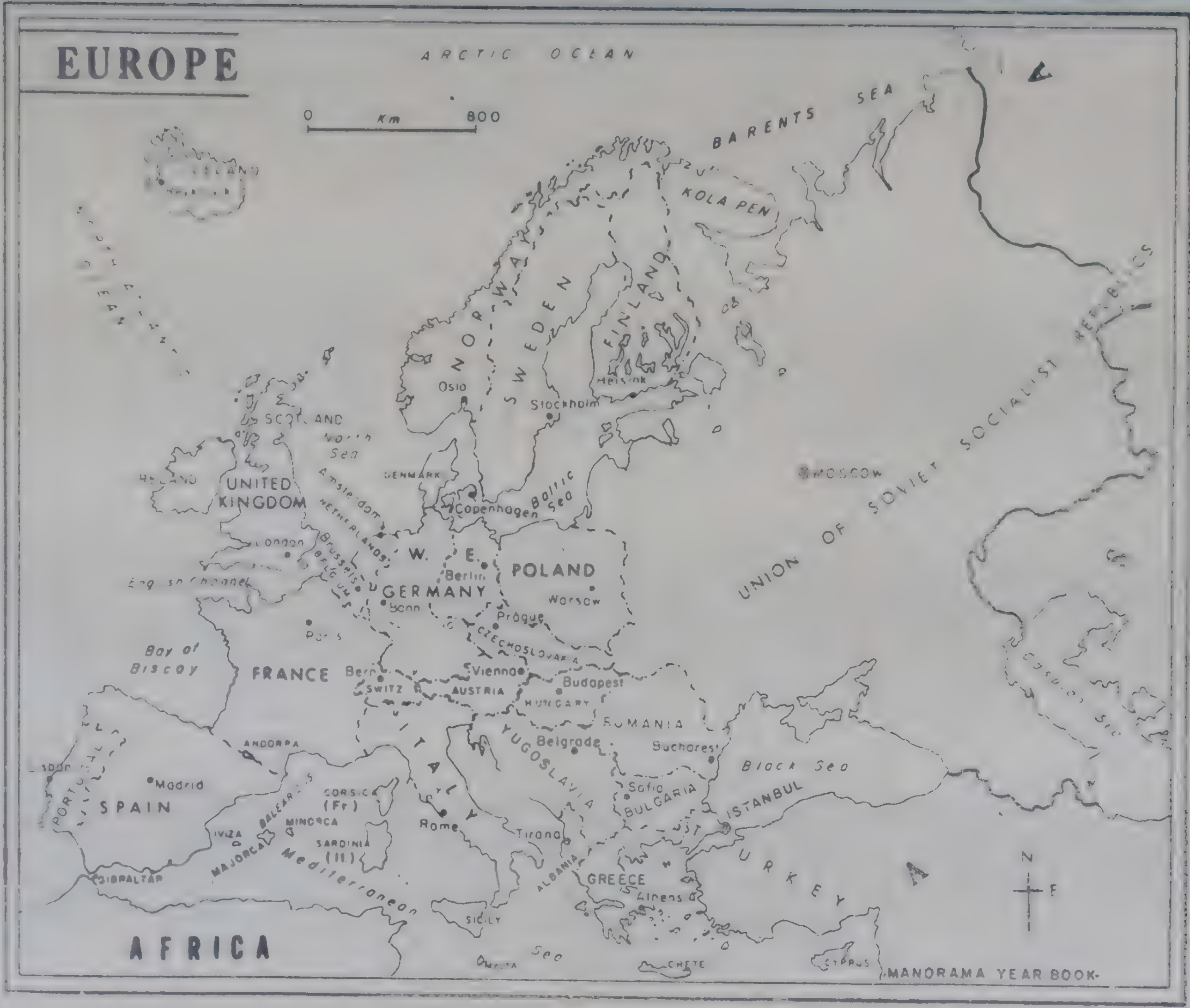

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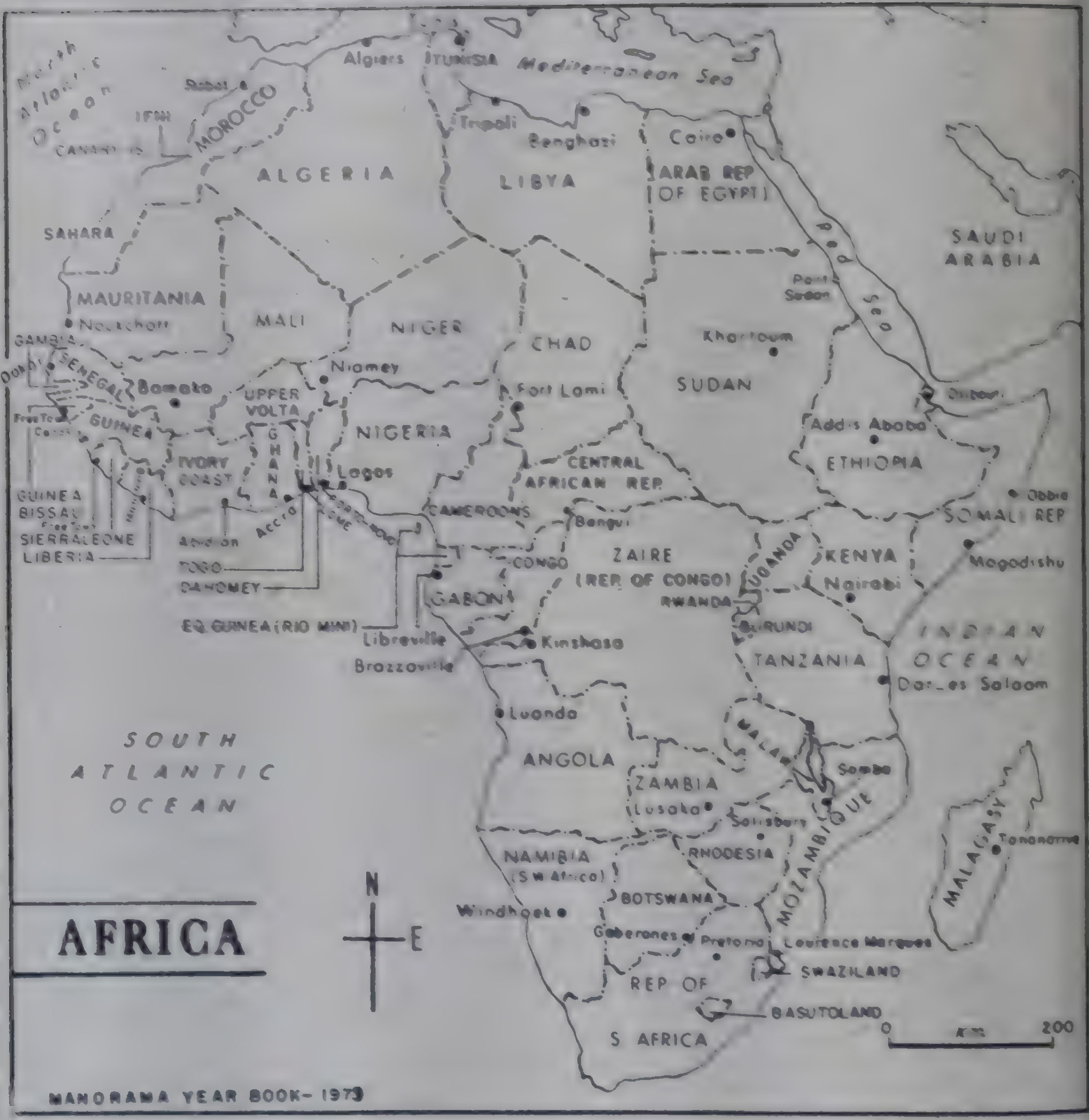
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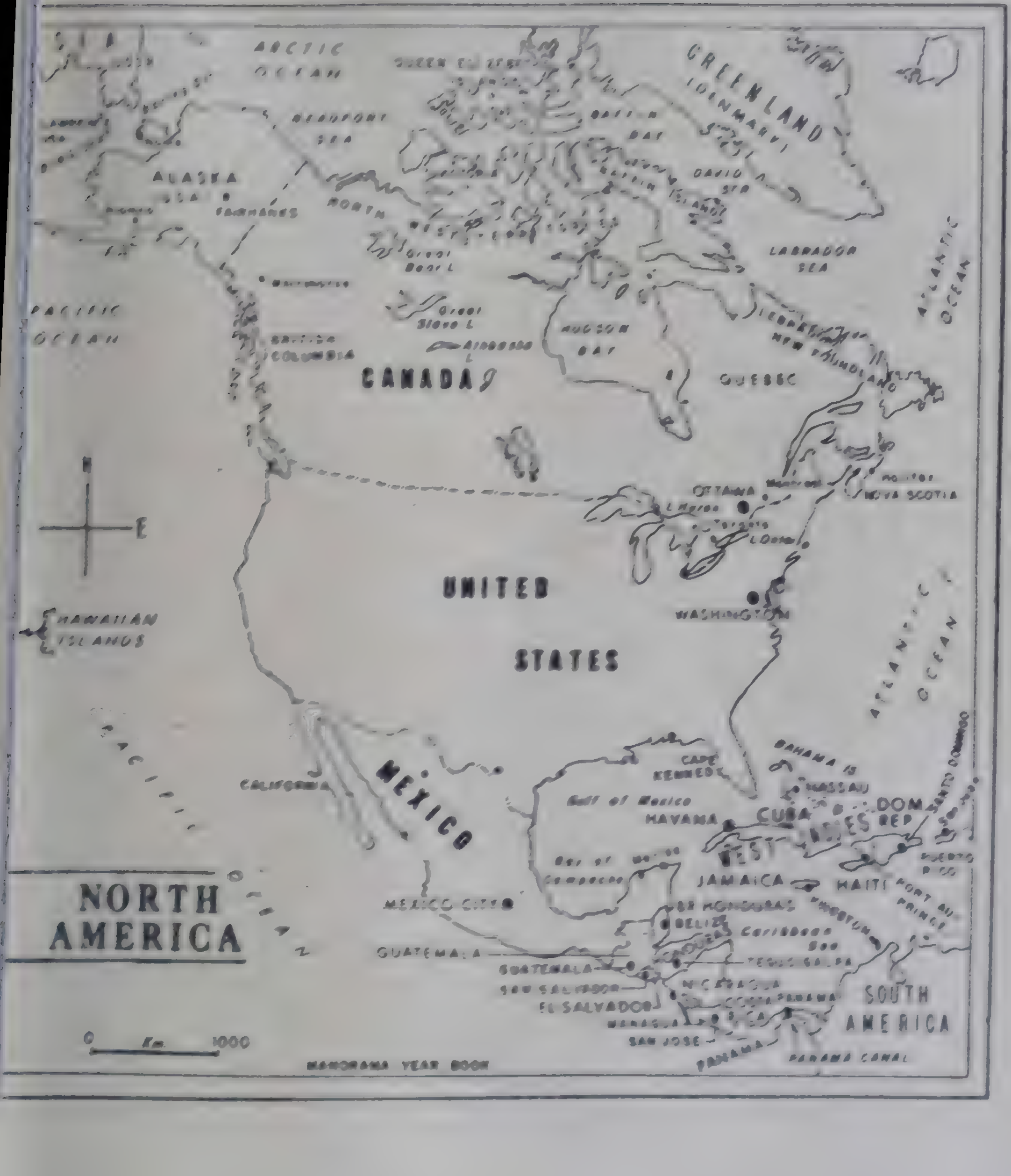
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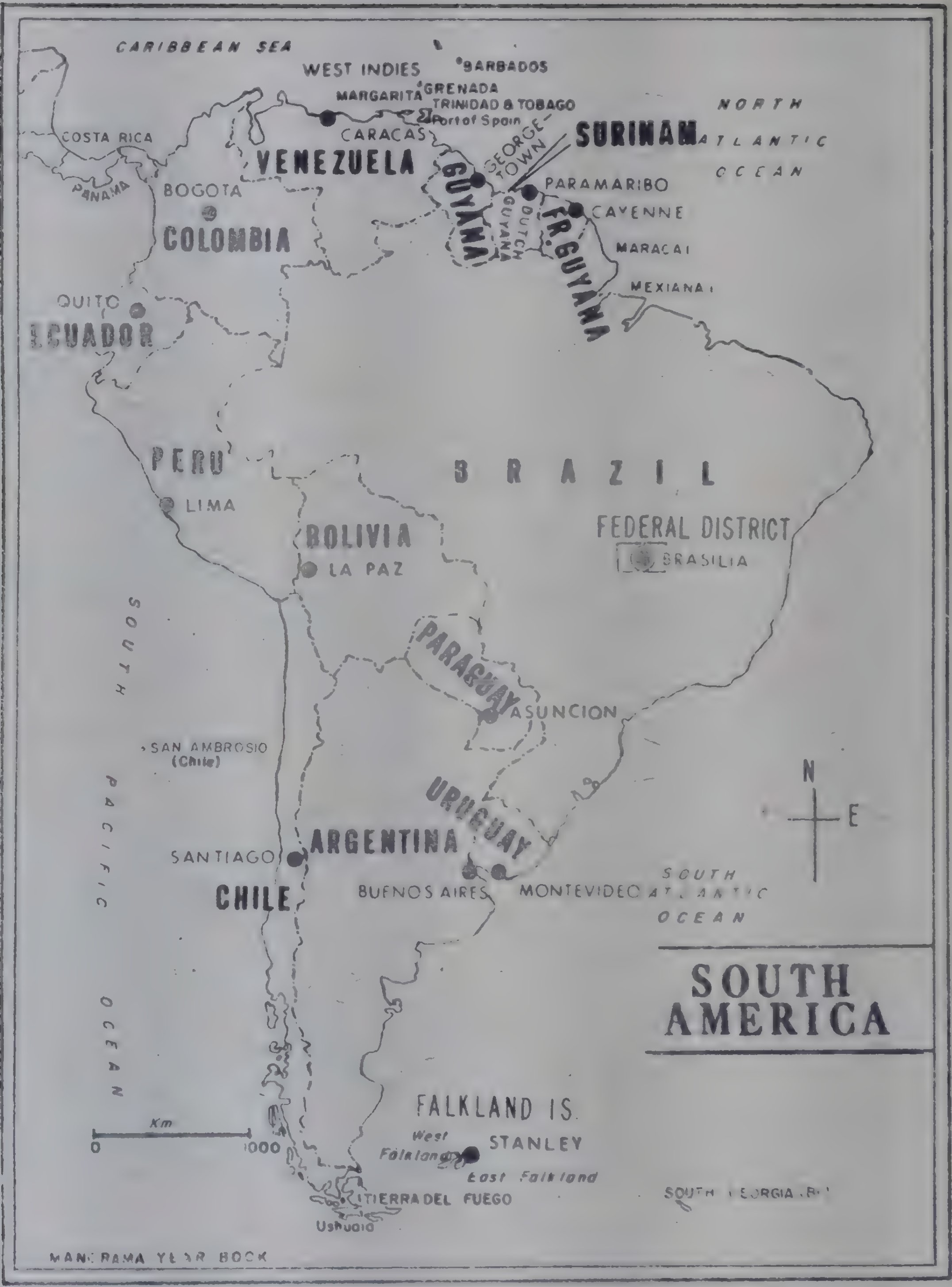
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LIMA
FEDERAL DISTRICT
BRASILIA
BOLIVIA
LA PAZ
SOUTH PACIFIC OCEAN
PARAGUAY
ASUNCION
SAN AMBROSIO (Chile)
N
E
URUGUAY
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MONTEVIDEO
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SOUTH GEORGIA
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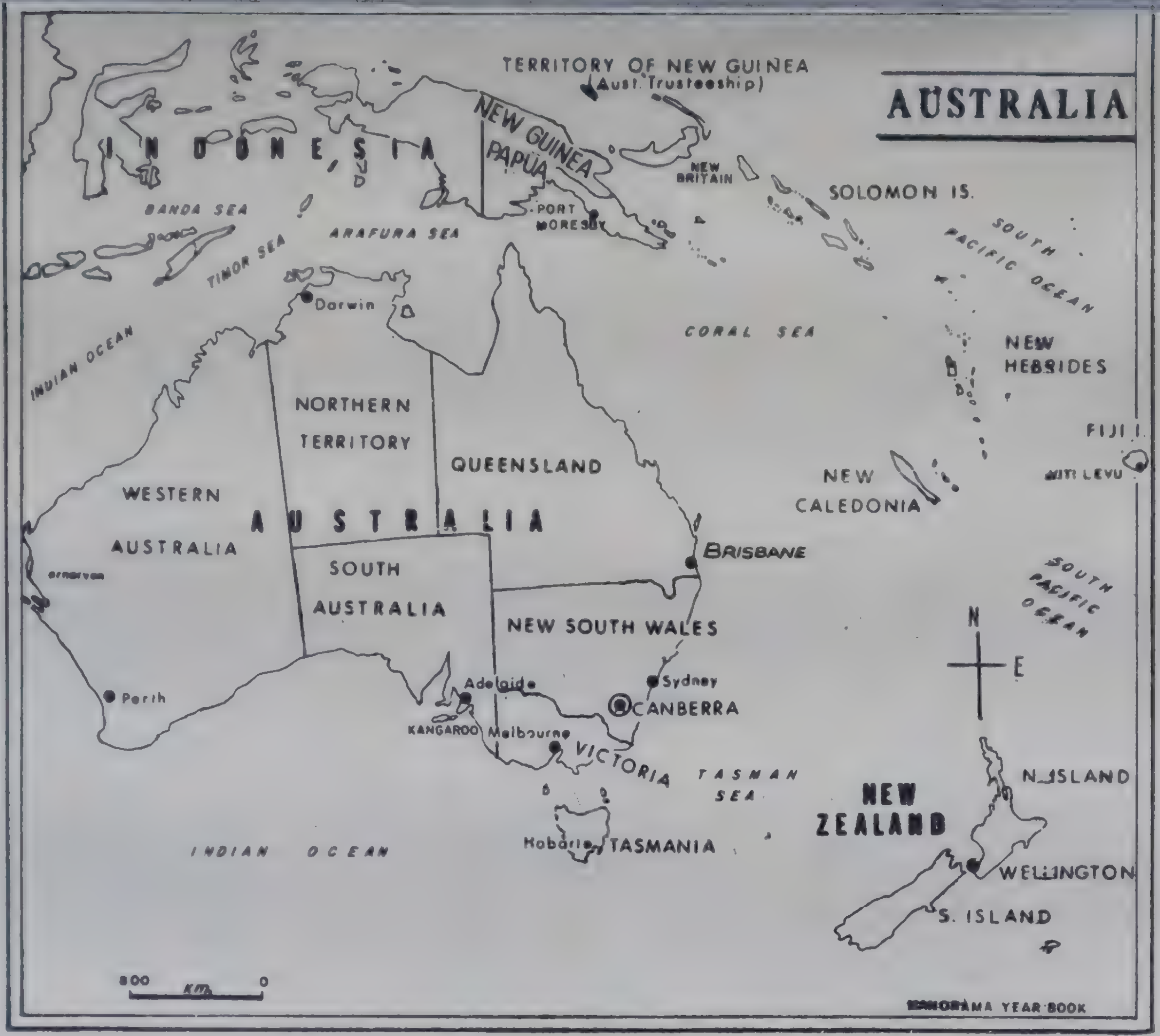
Ushuaia
MANORAMA YEAR BOOK


AUSTRALIA
TERRITORY OF NEW GUINEA
(Aust. Trusteeship)
NEW GUINEA
PAPUA
PORT MORESBY
NEW BRITAIN
SOLOMON IS.
SOUTH PACIFIC OCEAN
INDONESIA
BANDA SEA
ARAFURA SEA
TIMOR SEA
CORAL SEA
NEW HEBRIDES
FIJI I.
VITI LEVU
NEW CALEDONIA
INDIAN OCEAN
Darwin
NORTHERN TERRITORY
QUEENSLAND
WESTERN AUSTRALIA
AUSTRALIA
SOUTH AUSTRALIA
Carnarvon
Brisbane
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Sydney
CANBERRA
KANGAROO
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ORAMA YEAR BOOK

80. INDEPENDENT STATES

Table 60

The Biggest & the Smallest States

(In Area)

Name	Biggest Area (sq. mi.)	Location	Name	Smallest Area (sq. mi.)	Location
U S S R	8,649,538	Europe-Asia	Vatican City	0.17	Europe
Canada	3,851,809	N. America	Monaco	0.58	Europe
China	3,691,514	Asia	Nauru	8.00	S. Pacific
U S A	3,615,122	N. America	Tuvalu	10.00	S. Pacific
Brazil	3,286,488	S. America	San Marino	23.60	Europe
Australia	2,967,909	S. Pacific	Liechtenstein	61.00	Europe
India	1,269,346	Asia	Maldives	115.00	Indian Ocean
Argentina	1,068,301	S. America	Malta	122.00	Mediterranean
Sudan	967,500	Africa	Grenada	133.00	Caribbean
Algeria	919,595	N. Africa	St. Vincent	150.00	Caribbean

(In Population)

Name	Biggest Population	Location	Name	Smallest Population	Location
China	969,650,710	Asia	Vatican City	724	Europe
India	660,002,000	Asia	Tuvalu	7,000	S. Pacific
U S S R	264,803,970	Europe-Asia	Nauru	7,200	S. Pacific
U S A	221,089,000	N. America	San Marino	21,690	Europe
Indonesia	153,535,228	Asia	Liechtenstein	23,638	Europe
Brazil	119,501,000	S. America	Monaco	25,694	Europe
Japan	118,258,000	Asia	Andorra	32,000	Europe
Bangladesh	89,278,137	Asia	Kiribati	62,577	S. Pacific
Pakistan	81,455,500	Asia	Seychelles	66,114	Indian Ocean
Nigeria	71,507,300	Africa	Dominica	83,446	Caribbean

Note: Exchange Rate (Ex. R.) shows the units of national currency per U.S. Dollar as in Jan. - April 1981. Eg. 44.50 Afghani=1 U.S. dollar. Where national currencies are called dollars, they have to be understood as the dollars of the country concerned as against the U.S. dollar. C.U. indicates currency unit. It is shown as such when the exchange rates are not available. Exchange rates are taken from the U.N. Monthly Bullettin of Statistics, June, 1981.

AFGHANISTAN

Cap: Kabul; **Area**: 647,497 sq. km.; **Lang**: Pakhto (Pashtu), Dari, Persian; **Rel**: Islam; **Ex. R**: 44.500 Afghani= US $ 1.

Afghanistan, a land-locked republic in Central Asia, is bounded by USSR to the north, Pakistan to the east and south, China to the north-east and Iran to the west. Known originally as Ariana, then as Khorasan (the land of the Rising Sun). Afghanistan was formed as a separate state by Ahmed Shah Durrani in A.D. 1747.

Agriculture remains the mainstay of the economy. Sheep-rearing is another main occupation and the chief exports are livestock, fruits, wool and skins. The chief minerals are coal, salt, natural gas, petroleum, iron and copper.

ALBANIA

Cap: Tirana; **Area:** 27,748 sq. km.; **Lang:** Albanian; **Rel:** Religion has been officially abolished; **Ex. R:** 7.00 Lek= US $ 1.

Albania lies on the west coast of the Balkan peninsula in south-east Europe. It is bordered by Yugoslavia to the north and east, Greece to the south and the Adriatic and Ionian Seas to the west. Albania was first established as an independent state in 1912.

More than 40 percent of the land is farmland producing wheat, maize, sugar beet, cotton and tobacco and supporting a heavy livestock population mainly sheep and goats. The important minerals are coal, oil, chrome, copper and nickel. Industries include cotton textiles, woollen fabrics, leather goods, petrol, cement, sugar, beer and cigarettes.

ALGERIA

Cap: Algiers; **Area:** 2,381,741 sq. km; **Lang:** Arabic and French; **Rel:** Islam; **Ex. R:** 4.2525 Dinar=US $ 1.

Algeria is an independent republic in North Africa and extends for 640 miles along the shores of the Mediterranean between Tunisia and Libya on the east and Morocco and Mauritius on the west. Mali and Niger are to the south. The plains lying along the coast are very fertile. The Atlas Mountains reaching to altitudes of some 7000 ft. split the country into two. Algeria became an independent republic on July 3, 1962.

Agricultural products include wheat, barley, potatoes, artichokes, flax and tobacco. Fruits like dates, pomegranates and figs grow in abundance. Wine and olive oil are also produced. Cattle-raising, however, is the most important occupation. Important minerals are iron, zinc, mercury, copper, antimony, phosphates and petroleum.

ANDORRA

Cap: Andorra la vella; **Area:** 464 sq. km. **Lang:** Catalan; **Rel:** Christian; **C. U:** Franc (France), Peseta (Spain).

The principality of Andorra, founded in 1278, lies in the valleys of Eastern Pyrenees, between France and Spain, about half-way between Barcelona and Toulouse.

Andorra has no proper constitution and its international status is dubious. It is nominally subject to the suzerainty of France and the Bishop of Urgel in Spain.

The government is carried on by a Council of 28 elected members.

Andorra is an agricultural country, cereals, potatoes and tobacco being the principal crops. Irion, lead, alum, stone and timber are the principal products, though tourism is the main source of income.

Box 30
All Quiet in Kabul

KABUL, Aug. 30. Nestling in a vast bowl with rising rugged hills all around, Kabul today presents a picture of sharp contrasts.

By night when the cool winds sweep down from the hills, the city is calm, a curfew is clamped and the quiet broken occasionally by the echo of distant artillery fire.

By day the city bears no evidence of emergency except for armed guards outside all offices and public buildings and a strikingly strong ring of security around the palace which witnessed four revolutions in less than a decade of bloodless coup of 1973 in which Shah and with him the monarchy was banished, the bloody coup of April 1978 in which Mohammad Daud, the first Republican leader and brother-in-law of the king was killed, the displacement of Noor Mohammad Taraki in September 1979 by Hafizullah Amin and his own succession in another bloody coup by Babrak Karmal in December of that year.

The last major incident hitherto unreported was in Kandahar two weeks ago when a contingent of 200 insurgents mounted an attack on the jail. The attack was effectively repulsed by Afghan and Soviet forces.

There are no estimates of the number of Soviet troops stationed in Afghanistan. But this could be, according to usually reliable sources, anywhere around 100,000.

P.T.I. Report - Aug. 30, 1982.

ANGOLA

Cap: Luanda; **Area**: 1,246,699 sq. km; **Lang**: Portuguese, Bantu; **Rel**: Tribal and Christian; **C. U**: Kwanza

Angola, formerly Portuguese West Africa; is bounded by Zaire and Zambia on the north and east and by Botswana and Namibia on the south. The Atlantic lies to the west. Angola became an independent state in 1975.

The important food crops are millet, maize and cassava. The main cash crops are coffee, cotton, oil palm and sisal. Industries comprise textiles, brewing, cement, oil refining and sugar. Angola is famous for its gemstones, and produces about one-tenth of the total world supply. The main exports are crude petroleum, coffee, diamonds, iron ore, fish, sisal and timber

ANTIGUA & BARBUDA

Cap: St. John's; **Area**: 280 sq. km.; **Lang**: English and Patois; **Rel**: Christian; **C.U**: Dollar.

Antigua, one of the islands of British West Indies, is politicaly linked to two islands Barbuda and Redonda. Redonda is uninhabited. Antigua and Barbuda became independent on Nov. 1, 1981.

The population is of mixed European-Negro origin. The economy is agricultural. Sugar and sea island cotton are the main exports. Tourism is a major source of income.

ARGENTINA

Cap: Buenos Aires; **Area**: 2,766,889 sq. km; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 3165 peso=US $ 1.

Argentina lies at the tip of South America extending for some 2300 miles from Bolivia to Cape Horn. Its maximum width is 930 miles. The highest peak in the Americas, *Aconcagua*, is in Argentina. Argentina became an independent republic in 1810.

Argentina abounds in deposits of coal, lead, copper, zinc, gold, silver and sulphur. Petroleum is also found. Meat packing is the chief industry, with flour milling coming second. Agriculture and animal husbandry form important segments of the economy.

AUSTRALIA

Cap: Canberra-Federal Capital. State Capitals—Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, **Area**: 7,686,810 sq. km.; **Lang**: English; **Rel**: Christian; **EX. R**: 0.8692 dollar=US $ 1.

Australia, variously known as 'The Land of the Golden Fleece' and 'The Land of the Kangaroo', is the world's largest island and a continent. It is situated to the south-east of Asia, and is surrounded by the Indian Ocean in the north, west and south and by the Pacific Ocean in the east. It has a unique assortment of flora and fauna, not found elsewhere in the world. The full-blooded aboriginal population is primitive and nomadic. The boomerang was invented by these nomads.

Australia is a land of contrasts. It is geologically one of the oldest of land masses, yet it ranks as one of the youngest of nations. It is half a world away from Europe, but its people are largely of European descent and they follow a western way of life. One of the most sparsely populated of nations, it is also one of the most highly urbanised with 85% of its people living in cities.

Australia is a land of great distances, covering an area of 7,686,810 sq. km., almost twice the combined area of India and Pakistan. The flattest of all continents, Australia has an average elevation of less than 300 m, compared with the world mean of 700 m.

Vast areas of the continent receive only very small amounts of rainfall, limiting development mainly to the coastal fringes.

In 1901, the Australian colonies were federated into the Commonwealth of Australia, by an Act of Parliament. The federating states were six in number—*New South Wales, Victoria, Queensland, South Australia, Western Australia* and *Tasmania*. Two territories also form part of the Commonwealth.

During the 20th century Australia has developed into a modern industrial nation built upon the solid foundation of an efficient and productive agricultural system and large reserves of minerals. Australia is now an important producer and exporter of a wide range of agricultural products especially wool, wheat and meat and its mines provide minerals and metals of many types for use by local and overseas industries, including coal, iron ore, bauxite, gold, silver, lead, zinc, copper, nickel, oil and natural gas.

The nation's broad industrial and manufacturing base ranges from fashion garments to processed food, complex electronics to household devices, base metals to precision instruments, oil refining to plastics.

AUSTRIA

Cap: Vienna; **Area**: 83,853 sq. km.; **Lang**: German; **Rel**: Christian; **Ex. R**: 15.66 Schilling=US $ 1.

A republic of Central Europe, Austria is bounded by W. Germany, Switzerland and Liechtenstein in the west, Czechoslovakia and W. Germany in the north, Hungary in the east, and Italy and Yugoslavia in the south. Over 65 per cent of the country is mountainous. Austria, a republic since 1918, regained full sovereignty after World War II in 1955.

Economy depends mainly on mining and manufacturing, trade and services. Austria has iron ore and oil deposits, lignite, magnesite, lead and some copper.

THE BAHAMAS

Cap: Nassau; **Area**: 13,939 sq. km.; **Lang**: English; **Rel**: Christian; **Ex. R**: 1 Dollar (Bahamas)=US $ 1.

The Commonwealth of the Bahamas is an archipelago lying off the south-east coast of Florida. The Bahamas consists of more than 700 islands and 2000 cays and rocks. Only about 30 of the islands are inhabited. The largest island is *Andros* but *New Providence* is the most populous. The capital *Nassau* is situated on this island. Eighty-five per cent of the population is *Negro*, the rest are *Europeans*.

Education is free and compulsory between the ages of 5 and 14

Tourism is the main industry. Fishing constitutes the main occupation. Vegetables and fruits are also grown

The Bahamas became internally self-governing in 1964 and fully independent in 1973

BAHRAIN

Cap: Manama, **Area**: 669 sq. km., **Lang**: Arabic and English; **Rel**: Islam; **Ex. R**: 0.37600 Dinar = US $ 1.

Bahrain, which became an independent state on Aug. 15, 1971, is an Arab state comprising 33 small islands in the Arabian Gulf Bahrain is the biggest of the islands and has lent its name to the whole archipelago It is an independent monarchy.

The traditional occupations of cattle breeding, agriculture and fishing are still practised but many modern industries have also come up. Oil accounts for the lion's share of the state revenues.

The people enjoy a very high standard of life. Education is free upto the secondary level and heavily subsidised with scholarships at higher levels.

BANGLADESH

Cap: Dacca; **Area**: 143,998 sq. km.; **Lang**: Bengali and Bihari; **Rel**. Islam; **Ex. R**: 17.394 Taka=US $ 1.

Bangladesh is bounded on three sides by India. Burma lies to the south-east and constitutes the only non-Indian boundary of Bangladesh. Bangladesh became an independent state in 1971.

The economy is primarily agricultural. Rice is the most important food crop. Bangladesh is the biggest producer of jute in the world, commanding 80 per cent of the world's total production. Industrially, Bangladesh is backward. Textiles, sugar factories, hosieries, aluminium works and jute mills comprise the bulk of industrial production in the state.

BARBADOS

Cap: Bridgetown; **Area**: 430 sq. km ; **Lang**: English; **Rel**: Christian; **Ex. R**: 2.0113 dollars=US $ 1.

The island of Barbados is the most easterly of the Caribbean islands, lying about 250 miles north east of the mainland of South America. It is included in the Windward Isles. Barbados became fully self-governing within the Commonwealth on Nov. 30, 1966.

Agriculture and tourism dominate the economy of Barbados. Sugar, molasses and rum account for 90 per cent of exports

BELGIUM

Cap: Brussels; **Area**: 30,521 sq. km., **Lang**: Dutch and French, **Rel**: Christian, **Ex. R**: 36.03 Francs=US $ 1

Belgium, named after the Belgae, people of ancient Gaul who crossed the Rhine about the 6th century B C , has had a turbulent history. It became an independent monarchy in 1830. During both the world wars it was occupied by Germany but freed itself by the end of those wars

Belgium is located in the very heart of Europe, bordered by the Netherlands in the north, W. Germany and Luxembourg in the east, and France in the south.

Belgium is the most densely populated country in Europe. Although Belgium is essentially a manufacturing country, agriculture and forestry are also very important. The main crops are oats, rye, wheat, potatoes, barley and sugar beets. Coal is the country's only important mineral. Principal industries are steel and metal products, textiles, glass, fertilizer, sugar, heavy chemicals etc. Antwerp is the world's 4th largest port and also the world's biggest diamond-trading centre.

BELIZE

Cap: Belmopan; **Area**: 22,965 sq. km; **Lang**: English, **Rel**: Christian; **C. U**: Dollar.

Belize, formerly known as British Honduras, is a Central American republic with the Caribbean to the east, Mexico to the north-west and Guatemala to the south-west. Originally a British colony, it was granted autonomy in 1964 and became completely independent in 1981. The name Belize was adopted in 1973. Guatemala claims Belize as one of its territories but the claim has not been conceded by Britain. The original capital Belize City was laid waste by a hurricane in 1961. The capital was shifted to Belmopan, an inland town, in 1970.

More than half the population is made up of the so-called Creoles or English-speaking Negroes, found mostly in the coastal regions. The indigenous (Red) Indian population consists of Mayans and Kekchis who live mostly in the reservations.

Forest products especially timber form a major export item. Sugar and citrus fruits form the major products. Wild life includes the curious creature mantee—an amphian mammal—and several varieties of reptiles

BENIN

Cap: Porto Novo; **Area**: 112,622 sq. km.; **Lang**: French and Tribal dialects; **Rel**: Tribal and Islam; **Ex. R**: 262.7 CFA Francs=US $ 1

The People's Republic of Benin (formerly Dahomey) is located north of the Gulf of Guinea in West Africa. It is bounded by Togo, Upper Volta, Niger and Nigeria.

Formerly, one of the provinces of French West Africa, Benin became an independent state on Aug. 1, 1960. The country had been plagued by coups and counter-coups

Benin's principal products are palm oil, kernels, peanuts, cotton, coffee and tobacco.

BERMUDA

Cap: Hamilton; **Area**: 53.3 sq. km.; **Lang**: English; **Rel**: Christian; **Ex. R**: 1 dollar=US $ 1.

Bermuda is a group of some 300 coral islands in the Western North Atlantic. They are said to have been discovered by a Spaniard Juan de Bermudez in 1650. In 1968 it was given the status of a British Associate state with full internal autonomy.

Negroes make up two-thirds of the population. Persons of British or Portuguese stock form the rest.

The chief crops are vegetables, flowers (Easter lilies specially), bananas and citrus fruits. Tourism is the main source of revenue.

BHUTAN

Cap: Thimphu; **Area**: 47,000 sq. km.; **Lang**: Dzongkha and Nepali; **Rel**: Buddhist and Hindu; **C.U**: Ngultrum.

Bhutan is a mountain state in the Himalayas, with China on the north and India on the south. It is an absolute monarchy.

Agriculture is the chief occupation The principal products are rice, corn, and millet and forest produce like wax, lac, musk, etc. Timber and fruits are exported.

BOLIVIA

Cap: La Paz (Seat of Government) and Sucre (official capital); **Area**: 1,098,581 sq. km; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 24.51 Peso=US $ 1.

Bolivia, a South American state, lies astride the Andes. It is bounded by Brazil in the north and north east, Paraguay in the east, Argentina in the south and Chile and Peru in the west Lake Titicaca on the Peru-Bolivian border is the highest lake in the world (12,506 ft.).

Originally part of the ancient Inca Empire, Bolivia became independent in 1825. Bolivia has been named after

Simon Bolivar, the famous South American fighter for freedom. Bolivia, like most Latin American states, has had a number of coups and countercoups.

Agriculture, the mainstay of the country, engages 70 per cent of the people. Tin mining is the most important industry. Bolivia produces about 30,000 tons of tin, nearly 15 per cent of the world's total output. Antimony and tungsten are the next most important minerals.

BOTSWANA

Cap: Gaborone; **Area**: 600,327 sq. km; **Lang**: English and Tswana; **Rel**: Tribal and Christian; **Ex. R**: 0.80186 Pula= US $ 1.

The Republic of Botswana (formerly known as Bechuanaland) is located in Southern Africa, and is bounded by South Africa in the south and east, Namibia in the west and Rhodesia in the north east. Botswana became independent in Sept. 1966 and assumed its present name.

Cattle industry is the most important economic activity. Beef is the main export. Diamonds, manganese, asbestos, coal, copper and nickel are leading mineral resources.

BRAZIL

Cap: Brasilia; **Area**: 8,511;965 sq. km; **Lang**: Portuguese; **Rel**: Christian; **Ex. R**: 81 Cruzeiro=US $ 1.

Brazil, the largest South American state both in area and population, lies more or less in the centre of South America. It shares its frontiers with ten other countries—Argentina, Bolivia, Paraguay, Uruguay, Peru, Colombia, Venezuela, Guyana, Suriname and French Guiana. Its coastline is confined to the Atlantic sea-board. The bulk of Brazil lies in the tropics. It is a land of dense forests and mighty rivers. The Amazon and the Sao Francisco cover the centre of the country. The south is dominated by the River Plate system—the Paraguay, the Uruguay and the Parana. The majestic *Falls of Iguassu*, one of the natural wonders of the world, is on the border of Parana, one of the southern states of Brazil.

More than half of Brazil's population now live in the cities, which are responsible for generating about 35 per cent of the GNP. Among the most important cities are: *Sao Paulo, Rio de Janeiro, Belo Horizonte, Recife, Salvador and Brasilia*. Brasilia, a showpiece of modern architecture and town planning, was declared the capital on April 21, 1960.

Brazil's main industries are concentrated at Sao Paulo—shipbuilding, motor cars, textiles, foodstuffs, metals and chemicals. Brazil is the world's largest producer of coffee, bananas, manioc and sugar cane and the second biggest producer of oranges, maize and cocoa.

The major exports of Brazil are soya beans, sugar, coffee, iron ore, cocoa beans, maize, sisal and tobacco

Brazil possesses vast deposits of mineral wealth—iron, phosphates, uranium, manganese, copper, coal, platinum and gold. Oil is a state monopoly. The wax which is used for phonograph records and insulation is a monopoly product of the state.

BRUNEI

Cap: Bander Seri Begawan; **Area**: 5765 sq. sm; **Lang**: Malay, Chinese; **Rel**: Islam; **C.U**: Dollar.

The Sultanate of Brunei on the northern side of the island of Borneo lies between two Malaysian territories, Sabah and Sarawak. Brunei Malays, mostly Muslim, form more than half of the population. The Sultanate, once a powerful and independent kingdom, was annexed by Britain who in 1971 granted Brunei full internal autonomy.

Oil and natural gas are Brunei's most valuable resources. Much of Brunei's oil now comes from the offshore Ampa field. Rice is the chief food crop. Other crops are coconuts, sago and rubber. Rubber is an export item.

BULGARIA

Cap: Sofia; **Area**: 110,912 sq. km; **Lang**: Bulgarian, Turkish; **Rel**: Christian; **Ex. R**: 0.85 Lev=US $ 1.

Bulgaria in south-east Europe is bounded by the Black Sea on the east, Turkey and Greece on the south, Yugoslavia on the west and Romania on the north.

Bulgaria, an independent monarchy, became a republic after the Second World War.

The principal crops are wheat, rye, barley, maize, sugarbeet, oats, corn, potatoes, and tobacco. Coal, iron ore, copper, lead and zinc are the main mineral resources

BURMA

Cap: Rangoon; **Area**: 676,552 sq. km; **Lang**: Burmese and Tribal; **Rel**: Buddhism; **Ex. R**: 7.1058 Kyat=US $1.

A republic of south-east Asia, Burma is bordered by Bangladesh, India, China, Laos and Thailand. The country is watered by the *Irrawady* which forms one of the most fertile basins in all Asia.

Originally a part of British India, Burma became a separate unit of the British Commonwealth in April 1937. It became an independent country on January 4, 1948.

Burma is known as the "rice bowl of the Far East". The chief minerals are petroleum, lead, tin, zinc, tungsten, copper, antimony, silver and gems. The rubies, sapphires and jade found in Burma are especially famous. Teakwood is exported on a large scale.

BURUNDI

Cap: Bujumbura; **Area**: 27,834 sq. km; **Lang**: French and Kirundi; **Rel**: Tribal and Christian; **Ex. R**: 90.000 Franc=US $1.

The Republic of Burundi is a small state in Eastern Africa, bordered by Zaire in the west, Rwanda in the north and Tanzania in the east and south.

Burundi attained independence on July 1, 1962. Prior to independence, it formed part of the Belgian-administered UN Trust Territory of Rwanda-Urundi.

The population consists of *Hutu* or *Bahutu* tribesmen, *Tutsi* or *Watutsi* people and *Twa* or *Batwa pygmies*. The economy is entirely agricultural, manioc and sweet potato, being the important food crops and coffee the major cash crop.

CAMEROON

Cap: Yaounde (*Capital of the Federation as well as of East Cameroon State*); Tiko-Victoria-Bwa (*Capital of West Cameroon*); **Area**: 475,442 sq. km.; **Lang**: French and English; **Rel**: Tribal, and Christian; **CU**: CFA Franc.

Located in West Africa, Cameroon is bounded by the Gulf of Guinea, Nigeria, Chad, the Central African Republic, Gabon, the Congo Republic and Equatorial Guinea.

Cameroon, originally part of the German colony in W. Africa, became a republic in 1960. In 1961, British Cameroon was federated with Cameroon, forming the Federal Republic of Cameroon.

Cameroon has a central Government and two provincial governments—East Cameroon and West Cameroon.

Cameroon is mainly an agricultural country raising cocoa, palm oil, coffee, rubber, groundnuts, bananas, and cotton. East Cameroon is industrially developed, aluminium and chemicals being the main industries.

CANADA

Cap: Ottawa; **Area**: 9,976,139 sq. km; **Lang**: English & French; **Rel**: Christian; **Ex. R**: 1.196 Dollar=US $ 1.

Canada is the second largest country in the world. It occupies all of the northern-most part of N. America except Alaska in the west and the small French islands of St. Pierre & Miquelon. It is bounded in the north by the Arctic Ocean, Baffin Bay and the Davis Strait, in the north east and in the east by the Atlantic Ocean, in the south by the USA, in the west by the Pacific Ocean and in the north-west by the US state of Alaska. Twenty-seven per cent of the population speak French and the rest English.

Canada is a federation comprising 10 Provinces and 2 Territories. The federal capital is at Ottawa. It is a Dominion of the Commonwealth and is under a Governor General appointed by the Queen, on the recommendation of the Federal Govt. The provinces with more than a million population are Ontario (8), Quebec (6), British Columbia (2), Alberta and Manitoba (1 million each).

The table below shows the provinces & territories with their capitals and areas

Table 61

Federation of Canada-Provinces and Territories

Provinces	*Capital*	*Area (sq. miles)*
Alberta	Edmonton	255,285
British Columbia	Victoria	366,255
Manitoba	Winnipeg	251,000
New Brunswick	Fredericton	28,354
Newfoundland	St. John's	156,185
Nova Scotia	Halifax	21,425
Ontario	Toronto	412,582
Prince Edward Island	Charlottetown	2184
Quebec	Quebec	594,860
Saskatchewan	Regina	251,700
Territories		
Yukon Territory	Whitehoure	207,076
Northwest Territories	Yellowknife	1,304,903

From a primarily agricultural country famous for logging, fishing and fur, Canada has transformed itself into one of the leading industrial countries of the world. Automobile parts head the export list, followed by wood pulp and timber. Wheat is still a major item of export. Canada's industrial structure has been built up mainly by foreign investments, especially USA. Canada is today the world's largest producer of asbestos, silver, nickel and zinc. It is rich in many other minerals, iron, copper, uranium, cobalt, sulphur, lead and gold. It has vast reserves of oil and natural gas. Though Canada is ninth in the world in crude oil production it is Canada's biggest dollar earning mineral.

CAPE VERDE

Cap: Praia; **Area**: 4033 sq. km., **Lang**: Portuguese; **Rel**: Christian; **Ex. R**: 38.310 Escudo (1979 Dec.)=US $ 1.

Cape Verde, formerly a Portuguese colony, lies in the Atlantic Ocean, off west Africa. It consists of 10 islands and 5 islets divided into two groups, Windward and Leeward. The soil is poor and cultivation very little. Food is a major item of import. Salt, fish, coffee and groundnuts are exported. Cape Verde became independent on July 5, 1975.

When the Portuguese discovered the island, it was uninhabited. Portuguese settlers and the Negroes they brought in to work their plantations, form the basic stock of the present population.

CENTRAL AFRICAN REPUBLIC

Cap: Bangui; **Area**: 622,984 sq. km., **Lang**: French and Sangho; **Rel**: Christian and Tribal, **Ex. R**: 262.7 CFA Francs=US $ 1

The Central African Republic lies in the heart of equatorial Africa. It is bounded by Chad to the north, Sudan to the east, People's Republic of the Congo and Zaire to the south and Cameroon to the west.

The Central African Republic became self-governing in 1958, and fully independent in 1960, as a member state of the French Community. In 1966 Col Jean Bedel Bokasa, Chief of Staff of the Army, ousted President David Dacko and seized control of the government

Bokasa was made President for life in 1972. In 1976, he set himself up an emperor, after the Napoleonic pattern In 1979 a popular uprising drove out this two-bit Napoleon. Interestingly enough, it was Bokasa's own predecessor in office, viz. David Dacko, who overthrew the self-styled Emperor in a bloodless coup on Sept. 20, 1979.

Principal agricultural products are cotton and coffee. Cotton leads in exports. Diamonds account for half the country's export earnings. Uranium mining is becoming increasingly important.

CHAD

Cap: Fort-Lamy; **Area**: 1,284,000 sq. km.; **Lang**: French and Arabic; **Rel**: Muslim and Tribal; **Ex. R**: 262.7 CFA Francs=US $ 1.

The Republic of Chad is bounded by Libya on the north, Sudan on the east, the Central African Republic on the south and Cameroon and Niger on the west.

Formerly a province of French Equatorial Africa, Chad became independent on August 11, 1960.

The country's economy is entirely rural and based on agriculture and animal husbandry. Cotton and meat are the main exports. Cattle, sheep & camels are raised.

CHILE

Cap: Santiago; **Area**: 756,626 sq. km.; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 39,000 Peso=US $ 1.

The Republic of Chile lies on the Western seaboard of South America, occupying the strip of land between Peru and Bolivia in the north to Cape Horn in the south.

Originally a Spanish colony, Chile became independent on September 18, 1810

Though wheat and other cereals are cultivated, Chile has to import about one-third of its food. It is the world's fourth largest producer and the second largest exporter of copper. There are important deposits of nitrate, gold, silver and iron ore. Oil production provides about half the oil required by the country

CHINA

Cap: Beijing (Peking), **Area**: 9,561,000 sq km; **Lang**: Chinese (Mandarin) and Mongol, **Rel**: Confucian and Taoist; **Ex. R**: 1 607 Yuan=US $ 1. (1981 Jan)

The most populous country in the world and the third largest in area, China is bounded by the USSR, Mongolia, N. Korea, Vietnam, Burma, India, Bhutan, Nepal, Pakistan and Afghanistan. China is made up of 21 provinces, 5 autonomous regions and three municipalities—Peking, Shanghai and Tientsin

One of the oldest countries in the world, China became a republic in 1912. The People's Republic of China was proclaimed in Peking on September 21, 1949

On Oct. 26, 1971 China was admitted as a member of the UN displacing nationalist China (Taiwan).

China is essentially an agricultural country. The main crops are rice, other grains, tea, tobacco, sugarcane, jute, soya, groundnut and hemp. The main forest products are teak and ting oil. Among principal industries are cotton and woollen mills, iron, leather and electrical equipments. The chief minerals are coal, manganese, iron ore, gold, copper, lead, zinc, silver, tungsten, mercury, antimony and tin. Petroleum industry is steadily growing.

China is a nuclear power well advanced in space technology. It launched its first earth satellite in April, 1970.

Table 62

Provinces and Regions

Name†	*Area sq. km.*	*Population‡*
Anhwei (Anhui)	139900	30633407
Chekiang (Zhejiang)	101800	22865747
Fukien (Fujian)	123100	13142721
Heilungkiang (Heilongjiang)	463600	11897309
Honan (Henan)	167000	44214594
Hopei (Hebei)	202700	37886020
Hunan (Hunan)	210500	33226954
Hupeh (Hubei)	187500	27789693
Inner Mongolia• (Nei Monggol)	1177500	7338000
Kansu (Gansu)	366500	11000000
Kiangsi (Jiangxi)	164800	16772865
Kiangsu (Jiangsu)	102200	40963000
Kirin (Jilin)	187000	11290073
Kwangsi-Chuang• (Guangxi Zhuang)	220400	17591000
Kwangtung (Guangdong)	231400	36740000
Kweichow (Guizhou)	174000	15037310
Liaoning (Liaoning)	150000	20566000
Ningsia Hui• (Ningxia Hui)	66400	1800000
Shansi (Shanxi)	157100	14314485
Shantung (Shandong)	153300	48876548
Shensi (Shaanxi)	195800	15881281
Sinkiang-Uighur• (Xinjiang Uygur)	1646800	4873608
Szechwan (Sichuan)	569000	65685063
Tibet• (Xizang)	1221600	1273969
Tsinghai (Qinhai)	721000	1676534
Yunnan (Yunnan)	436200	17472737

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† New Pinyin spellings in parentheses.

• Autonomous region. ‡ 1953 census

COLOMBIA

Cap: Bogota; **Area:** 1,138,400 sq. km; **Lang:** Spanish; **Rel:** Christian, **Ex R:** 52.94 Peso=US $ 1.

The Republic of Colombia, situated in the north west of South America, extends up to the Isthmus of Panama, with the Caribbean Sea on the north and the Pacific Ocean on the west. It is bounded on the north east by Venezuela, on the east by Brazil and on the south by Peru and Ecuador. *Bogota*, the capital founded in 1538, is situated in the Andes, 8600 ft above sea level

Colombia was once a part of the South American Spanish Empire. In 1819, Simon Bolivar defeated decisively the Spanish forces breaking the hold of Spain. Bolivar's plan to unite New Granada with Venezuela and Ecuador in the Greater Colombia Confederation was fulfilled by the Congress of Angostura (1819), lasting until 1830

The nation began its independent existence as the "State of New Granada", the name being modified several times until 1886, when that of the "Republic of Colombia" was officially adopted.

Colombia's main product is coffee, which accounts for 61.2 per cent of the country's exports. Other products are bananas, fresh flowers, cotton fibre, sugar, rice, tobacco, maize and wheat. The country is the world's leading producer of emeralds and is a substantial producer of platinum and gold. It holds the largest coal reserves in Latin America, rich nickel deposits and natural gas fields

Industries include textiles, beverages, food products, chemicals and non-metallic minerals

THE COMOROS

Cap: Moroni, **Area**: 2274 sq. km; **Lang**: Arabic and Comoran, **Rel**: Muslim and Christian; **Ex. R**: 262.70 CFA Francs = US $ 1

The Comoro Islands, formerly a French Overseas Territory, lie at the northern end of the Mozambique Channel, between Africa and Madagascar. The archipelago consists of 4 islands—*Grande-Comoroe, Anjouan, Mayotte* and *Moheli* and a number of islets and coral reefs. The main islands are volcanic and Grande-Comoroe, the largest island, is dominated by Mount Karthala (2361 m), an active volcano. The islands are densely forested

The population is a mixture of various strains—Arabs, Africans, Malagasys, Persians, Indians, Indonesians and Europeans African and Arab influences are strongest A purely European population of around 1500 completes the scene. Grande-Comoroe is the most populous island and has as capital and principal town, *Moroni*. Agriculture is the mainstay of the economy. It provides the major items of export—vanilla, copra, sisal, cloves and essential oils such as citronella and ylang-ylang. The economy, however, is not self-supporting and the country runs into a perpetual trade deficit

THE CONGO*

Cap: Brazzaville; **Area**: 342,000 sq. km; **Lang**: French and Lingala; **Rel**: Tribal and Christian; **Ex. R**: 262.7 CFA Francs = US $ 1.

The People's Rep. of the Congo is bounded on the north by Cameroon and the Central African Republic, on the east and south by Zaire and on the west by the Republic of Gabon and the Atlantic.

Formerly part of the French Equatorial Africa, the Republic of the Congo became autonomous within the French Community in 1958 and fully independent in Aug. 1960. Ever since independence, Congo had experienced only troubles. In 1969 a new constitution was promulgated.

Chief agricultural products are palm oil, kernels, peanuts and sugar. Diamonds are mined and form a major item of export. Potash is another important mineral. Main exports are timber, diamonds, palm oil, crude petroleum, sugar and groundnuts.

COSTA RICA

Cap: San Jose; **Area**: 51,100 sq. km; **Lang**: Spanish; **Rel**: Christian; Ex. R: 8.570 Colon = US $ 1 (Dec. 1980).

The Republic of Costa Rica is a Central American state. It lies between Nicaragua and Panama. The Caribbean Sea is on the east and the Pacific Ocean on the west.

For nearly three centuries Costa Rica formed part of the Spanish American dominion. In 1821 it became independent.

The country is mainly agricultural. Coffee is the most important product, accounting for about half the exports. Bananas, cocoa, cattle and recently sugar are the other items of export. Rice, maize, corn and beans are produced. Sulphur, limestone and bauxite are the chief minerals. Industry is mainly small scale—textiles, leather goods, chemicals and processed food.

CUBA

Cap: Havana; **Area**: 110,922 sq. km.; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 0.74 Peso = US $ 1.

Cuba, the largest island in the Greater Antilles group is known as the Pearl of Antilles:. Its neighbours are USA, Mexico, Jamaica and Haiti. The Bahama Islands are to the north.

Columbus discovered Cuba in 1492 and Spain ruled it for four centuries. In 1898 Cuba became an independent republic

In 1959 Dr. Fidel Castro overthrew General Batista, the dictatorial President, and took over power

Cuba's economy is mainly dependent on tobacco and sugar. Cuba is the largest producer of sugar in the world Tobacco is the second largest crop

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* There were two African States both named Congo, in the sixties. One of them the Democratic Republic of the Congo, changed its name to Zaire. Congo (Brazzaville) is now the only State that takes the name Congo and is conveniently referred to as the Congo.

Cattle, poultry and fishing have become important in recent years. Cuba is rich in nickel deposits. Copper, chromite and manganese are also found. The important industries are sugar, cement, fertilizers, textiles, cigarettes, sponges and dairy products.

CYPRUS

Cap: Nicosia; **Area**: 9251 sq. km.; **Lang**: Modern Greek and Turkish; **Rel**: Christian and Muslim; **Ex. R**: 0.40725 pound=US $ 1.

The Republic of Cyprus lies in the Mediterranean Sea, about 44 miles south of Turkey, and 65 miles west of Syria.

Cyprus became a Crown Colony of Britain in 1925. British rule was opposed both by the Greek and Turkish factions.

The Greeks demanded union with Greece (*Enosis*). The Turks opposed the movement. In February 1952 the conflict ended on a compromise and Cyprus became independent. Archbishop of Cyprus Makarios III was elected the first President in December, 1959. But factional fighting broke out in 1963.

Although Cyprus has derived its name from copper, for which the island was famous in ancient days, the country is essentially agricultural. About 30 per cent of land is under cultivation. The chief crops are wheat, barley, fruits and olive. Minerals include cupreous and iron pyrites and asbestos. Copper and gypsum account for two-thirds of the exports.

CZECHOSLOVAKIA

Cap: Prague; **Area**: 127,877 sq. km; **Lang**: Czech and Slovak; **Rel**: Christian **Ex. R**: 11.94 Koruna=US $ 1.

A socialist republic landlocked in Central Europe, Czechoslovakia lies between Poland, USSR, Hungary, Austria and Germany (West and East). The State is composed of two main population groups: Czechs and Slovaks

Effective control of the entire governmental apparatus resides in the Central Committee of the Czechoslovak Communist Party

The Czechoslovak Socialist Republic was established in Jan. 1969 as a federal state of two nations of equal rights—the Czechs and the Slovaks. The Czechs and the Slovaks form two republics within the federation, each with its own government.

Czechoslovakia is a highly industrialized country. Principal exports are machinery and equipment, chemicals and fuels, glass and other manufactured goods. Wheat, barley, potatoes and sugar beet are among the important crops.

DENMARK

Cap: Copenhagen; **Area**: 43,074 sq. km.; **Lang**: Danish; **Rel**: Christian; **Ex. R**: 6.980=US $ 1.

Denmark is situated in northern Europe between the North Sea and the Baltic. It comprises the peninsula of Jutland, the islands of Zealand, Funen and Bornholm and 480 smaller islands. Greenland and the Faroe Islands also form part of the Kingdom of Denmark.

Denmark is a constitutional monarchy, the Queen and the Parliament (Folketing) jointly holding legislative powers.

About 70 per cent of the land is under cultivation. Denmark is one of the largest exporters of dairy products. Fisheries form an important occupation. Denmark is famous for its co-operative institutions. The first co-operative society was established in 1866. Shipbuilding, machinery of different types, textiles, iron and steel-ware account for a major portion of industry.

DJIBOUTI

Cap: Djibouti; **Area**: 21,783 sq. km.; **Lang**: Somali and French; **Rel**: Islam; **Ex. R**: 177.72 Francs (1980 Dec.)=US $ 1.

Djibouti, first known as French Somaliland and then as the French Territory of Afars and Issas, became independent on June 26, 1977 under the name of Djibouti.

Lying between Ethiopia and Somalia and looking out on the Red Sea and the Gulf of Aden, the state is of extreme strategic importance.

The land is economically poor being mostly volcanic desert. The indigenous population is mostly Muslim. Agriculture is possible only in restricted areas with irrigation facilities. Goats, sheep and camels form the major wealth of the state. Salt is a major product with huge salt deposits in the lakes of Alol and Assal. Trade is almost entirely based on the capital Djibouti.

DOMINICA

Cap: Roseau; **Area**: 750 sq. km.; **Lang**:

English and French Patois; **Rel**: Christian; **Ex. R**: 2.7000 Dollar = US $ 1.

Dominica lies in the Lesser Antilles. Once a British protectorate, it assumed the status of a British Associate State in 1967 and became fully independent in 1978. The island is volcanic in origin and largely mountainous. The population includes Negroes, Mulattoes, Carib Indians and Europeans.

Limes, bananas, cocoa, and coconuts are the main crops. Exports include bananas, cocoa, copra and fruits. Foodgrains, machinery and textiles are the main imports.

DOMINICAN REPUBLIC

Cap: Santo Domingo; **Area**: 48,422 sq. km.; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 1.000 Peso = US $ 1.

The Dominican Republic occupies the eastern two-thirds of Hispaniola, the second largest island of the Greater Antilles. Haiti bounds it on the west. The Atlantic borders it in the north and the Caribbean in the south. Originally under Spain, the Dominican Republic became independent in 1844.

The state is predominantly agricultural. The most important crops are sugarcane and coffee. Various minerals are found, principal among which are gold, silver, ferro-nickel and bauxite

ECUADOR

Cap: Quito; **Area**: 283,561 sq. km.; **Lang**: Spanish and tribal dialects; **Rel**: Christian, **Ex. R**: 25.00 Sucre = US $ 1.

Ecuador lies on the west coast of South America. It is bounded on the north by Colombia, on the east and south by Peru and on the west by the Pacific Ocean. Two ranges of the Andes cross the country from north to south, dividing it into three natural regions, coastal, highlands and the orient *Guayaquil* is the chief seaport and airport. The *Galapagos Islands* belong to Ecuador Ecuador, a part of the great Inca Empire, came under Spanish rule in 1533. It became independent in 1830

The economy is dominated by three commodities, bananas, coffee and cocoa. Ecuador is the world's largest producer of bananas. Sugar, African palm, and rice are grown. Silver ore is now the chief mineral product. There are large deposits of copper, gold and zinc. The production of petroleum is increasing. The so-called 'Panama' hats made of Toquilla straw are made in Ecuador. The country is also the chief source for balsawood which is very light (about half as heavy as cork) but very strong

EGYPT

Cap:Cairo; **Area**: 997,677 sq.km.; **Lang**: Arabic; **Rel**: Muslim and Christian; **Ex. R**: 0.70000 Pound = US $ 1.

Egypt, traditionally known as the Gift of the Nile, occupies north east Africa and is bounded by the Gulf of Aqaba, Israel, Sudan, Libya, the Mediterranean Sea and the Red Sea.

Egypt has one of the oldest civilizations in the world, its recorded history going back to more than 5000 B.C. In 1922 Egypt became an independent monarchy and in 1952 a republic.

The main agricultural area is Lower Egypt which covers the delta of the Nile. The chief crops are cotton, onions, wheat, maize, millet, rice, sugarcane and fruits of various kinds.

A variety of minerals is found in Egypt, principally phosphate rock and petroleum. Others are manganese and iron ore, natural gas and salt. Principal exports are cotton, rice, mineral products, textiles, refrigerators, tyres, cement and electrical instruments.

EL SALVADOR

Cap: San Salvador; **Area**: 21,393 sq. km.; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 2.5000 Colon = US $ 1

El Salvador is bounded on the north-west by Guatemala, on the north and east by Honduras and on the south by the Pacific Ocean.

El Salvador became independent in 1821

The country is predominantly agricultural The principal crop is coffee which provides half the exports Other products are cotton, maize and sugar Fisheries are being developed and figure prominently in the export list Industry is growing

EQUATORIAL GUINEA

Cap: Malabo (formerly Santa Isabel), **Area**: 28,051 sq. km., **Lang**: Spanish and Fang, **Rel**: Christian, **Ex. R**: 66 149 Ekuele (1979) = US $ 1

Equatorial Guinea, formerly Spanish

Guinea, comprises the islands of *Fernando Poo, Corisco, Great Elobey, Small Elobey* and *Annobon* and the mainland territory of *Rio Muni* on the west coast of Africa. In 1975, almost all place names were changed by President Macias Ngueme. The capital Santa Isabel thus became Malabo.

Francisco Macias Nguema was overthrown in a coup after an 11-year reign of terror, by a supreme military council headed by his nephew, Lt-Col. Teodoro Obiang Nguema Mbasogo on Sept. 29, 1979 (See Box supra).

The island of Fernando Poo is mostly mountainous. Coffee is cultivated up to 3000 ft. and cocoa up to 2000 ft. There are also forests of ebony, mahogany and oak. Other products are cocoa, coffee, timber, palm oil and bananas.

ETHIOPIA

Cap: Addis Ababa; **Area**: 1,221,900 sq. km. including Eritrea; **Lang**: Amharic (official language), English; **Rel**: Christian and Islam; **Ex. R**: 2.0700 Birr=US $ 1.

Ethipia is a mountainous country in North East Africa, having access to the Red Sea, through the province of Eritrea, which was federated with Ethiopia in 1952.

Ethiopia is one of the most ancient countries of the world, with a colourful history. The Ethiopian emperors claimed descent from Solomon and the famous Queen of Sheba. The last Emperor of Ethiopia Hale Sellasie I was deposed by the Armed Forces which took over the govt. in 1974.

The economy is mainly agricultural and pastoral. Coffee export earned 70% of all revenue in 1977. Hides and skins, pulses and oil seeds are also exported. Industry is confined to food processing, manufacture of textiles and goods for local consumption.

FIJI

Cap: Suva; **Area**: 18,376 sq. km.; **Lang**: English and Figian; **Rel**: Christian and Hindu; **Ex. R**: 0.83389 Dollar=US $ 1.

Fiji consists of about 800 islands, lying 1100 miles north of New Zealand. The largest of the islands *Viti Levu* constituting more than half of the total land area of Fiji islands is the seat of the capital, *Suva*. Fiji lies on the main route between Australia, New Zealand and North America and is the centre of communications in the South West Pacific.

These islands came under British rule in 1874. From 1879, indentured Indian labour was imported into the islands to work on European sugar plantations. Practically all the Indian workers settled permanently in the islands. Their descendants now form 50 per cent of the population. Melanesians, the original inhabitants, make up 43 per cent, the rest being made up of Europeans, Chinese and others. On Oct. 10, 1970 Britain granted independence to Fiji.

Fiji is a famous tourist centre. Its major products are agricultural. Sugar and coconuts form 90 per cent of the total exports. Mining is limited and industries are few.

FINLAND

Cap: Helsinki; **Area**: 337,032 sq. km.; **Lang**: Finnish and Swedish; **Rel**: Christian; **Ex. R**: 4.209 Markka=US $ 1.

The Republic of Finland is bordered on the north by Norway, on the west by Sweden and the Gulf of Bothnia, on the south by the Gulf of Finland and on the east by the USSR

Finland is a Baltic State, which once formed part of the Russian Empire It became an independent republic in 1917.

Finland's economy is based on conifer forests which cover 65 per cent of the land. Paper and pulp industry is highly developed. Other industries are shipbuilding, metals, textiles, leather and chemicals. Finland has a fairly big fleet of merchant marine with a gross tonnage of 2,274,605 (1977).

FRANCE

Cap Paris. **Area**: 551,695 sq km . **Lang**: French; **Rel**: Christian; **Ex. R**: 5.2540 Francs=US $ 1.

France, the largest country in western Europe, lies between three big countries—Spain, Germany and Italy and the lesser states of Switzerland, Belgium and Luxembourg. The North Atlantic Ocean (Bay of Biscay) lies to the west and the English Channel to the north, while the Mediterranean Sea bounds the south. The island of Corsica—the birthplace of Napoleon—forms an integral part of France.

Once a grand monarchy, the French Revolution (1789-1793) made France a republic. Since then, republican and imperial forms of government followed one another until the Fifth Republic and the French Community came into being in 1958 under President Charles de Gaulle

France, agriculturally, is a country of small and medium farms, producing wheat, sugar beets, rye, barley, oats, potatoes, grapes, fruits and nuts. The country is self-sufficient in agricultural production and exports large quantities of agricultural products to other countries. Among manufactured products, the most important are chemicals, silk, cotton textiles, automobile, aircraft, ships, precision instruments, electronic euipments, perfumes and wines. Over the last 20 years urban development and technological progress have profoundly changed French people's everyday life, and the typical household is likely to contain a highly diversified array of goods like automobiles, refrigerators, washing machines, and television sets. On January 1, 1981 there were over 19 million telephones in service and some 100,000 public phone booths.

The *Gross Domestic Product* in 1980 was 2754.9 billion francs ($ 633.3 billion) compared with 2101.05 billion francs ($ 483 billion) in 1979 The 1980 per capita annual income was $ 11,763, up from $ 9,333 in 1979

France continues to draw more foreign visitors than any other country in Europe. Last year there were over 30 million tourists, contributing a total of $ 44 billion to the nation's coffers—8.5% of the gross national product.

GABON

Cap: Libreville, **Area**: 267,000 sq. km.; **Lang**: French and Bantu dialects; **Rel**: Christian and Tribal, **Ex. R**: 262.7 CFA Francs=US $ 1

The Gabon Republic, situated on the western coast of Africa, is bounded by Equatorial Guinea, Cameroon, the Congo Republic and the Atlantic Ocean Formerly a province of French Equatorial Africa, Gabon attained independence on Aug 17, 1960

The economy, hitherto largely dependent on forestry, is now dominated by mining The manganese deposits at Moanda in the south is one of the world's richest deposits Crude oil production is already the fifth highest in Africa. Uranium, gold and iron ore are also mined

THE GAMBIA

Cap: Bathurst; **Area**: 11,295 sq. km., **Lang**: English and Mandinka; **Rel**. Muslim and Christian; **Ex. R**: 1.8688 Dalasi=US $ 1.

The Gambia is a narrow strip of land in West Africa, extending inland from the Atlantic Ocean for about 30 miles on either side of the Gambia River and surrounded on three sides by Senegal. Nearly half the inhabitants belong to the Mandingo tribe.

Formerly a British colony and protectorate, Gambia became an independent state within the Commonwealth on Feb. 18, 1965 and a Republic in April 1970.

Peanuts are the main crop, along with rice and palm kernels. Textiles, food and manufactured goods are significant items of import.

GERMANY (East)

(German Democratic Republic)

Cap: Berlin; **Area**: 108,179 sq. km.; **Lang**: German; **Rel**: Christian; **Ex. R**: 2.10 Marks=US $ 1.

The German Democratic Republic (East Germany) is bounded on the north by the Baltic Sea, west, south-west and south by West Germany, south east by Czechoslovakia and east by Poland along the line of the rivers Oder and Neisse.

When Germany surrendered to the Allies in 1945 the country was divided into four zones of Allied occupation. The northern section of East Prussia with about 14 per cent of the population and 24 per cent of the area of the former Reich came under Russian occupation. The area under Russian occupation was constituted into the independent socialist state of the German Democratic Republic on October 7, 1949.

Important crops of East Germany are wheat, rye, barley, oats and potatoes. Farming is organised on state-sponsored co-operative basis. The only natural power source is lignite (brown coal) which supplies 90 per cent of the basic energy. Industries are highly developed—machines, chemicals, heavy engineering and shipbuilding. Special stress is laid on quality products like optics, electronics and precision tools. The Leipzig trade fairs are well known throughout the world.

GERMANY (West)

(Federal Republic of Germany)

Cap: Bonn; **Area**: 248,625 sq. km.; **Lang**: German, **Rel**: Christian; **Ex. R**: 2.214 Deutsche Marks = US $ 1.

The Federal Republic of Germany lies in the heart of Europe. Its neighbours to the west are the Netherlands, Belgium, Luxembourg and France, to the south Switzerland and Austria, to the east Czechoslovakia and East Germany and to the north Denmark.

It was Bismarck, Chancellor of Prussia, who laid the foundation of the German Empire in 1867. After the defeat of Germany in the Second World War the erstwhile German territory was divided into two occupation areas, Russia occupying East Germany, and USA,Britain and France occupying West Germany. The city of Berlin was also divided into West Berlin (USA, Britain and France) and East Berlin (Russia). West Germany came into being on May 23, 1949. The German Federal Republic consists of 10 states (Lander). West Berlin is also a state of the Federal Republic.

West Germany showed phenomenal economic growth during post-war years in industrial production, notably in iron and steel, vehicles, engineering, shipbuilding, electrical goods and chemicals. Since the currency reform in 1948 the economy of W. Germany has been completely recast. Today it is the second largest trading country in the world. It is also playing a major part in reviving economic activity worldwide. In the Federal Republic, the GNP rose from DM 302,300 million in 1960 to DM 1,193,400 million in 1977. The national income rose from DM 240,100 million (1960) to DM 927,400 million (1977), marking a rise in per capita income from DM 4331 (1960) to DM 15,106 (1977).

GHANA

Cap: Accra; **Area**: 239,460 sq.km.; **Lang**: English (official language) and eight major national languages; **Rel**: Christian and Muslim; **Ex. R**: 2.7500 Cedi = US $ 1.

Ghana, named after an earlier state along the river Niger (AD 800—1070), is composed of the former British Gold Coast Colony and the British-ruled Togoland in Western Africa

Ghana became an independent republic within the British Commonwealth on July 1, 1960.

Ghana is primarily an agricultural country. It is the world's largest producer of cocoa which constitutes its biggest export item. Other cash crops include kolanuts, palm products, bananas, coffee, shea-nuts and rubber. It also exports timber, gold, diamonds, manganese and bauxite.

GREECE

Cap: Athens; **Area**: 131,990 sq. km.; **Lang**: Modern Greek; **Rel**: Christian; **Ex. R**: 53.74 Drachma = US $ 1.

Greece or the Hellenic Republic occupies the southern part of the Balkan peninsula in the Mediterranean with the Ionian Sea on the west and the Aegean Sea on the east. Albania, Yugoslavia and Bulgaria lie to the north of Greece, and Turkey to the east.

In ancient times, Greece was the seat of democracy, learning and culture. Politically independent till the first century B.C., the Greek states succumbed to Roman might in the latter half of the first century B.C. Later they came under the Byzantine and Ottoman empires in succesion until 1830 when Greece regained its freedom as a monarchic state. After many vicissitudes of fortune monarchy was abolished in Greece in 1974. It has been a republic since.

Greece having been till recently an agricultural country has now developed many industrial branches. Accordingly Greece's production includes wheat, maize, barley, tobacco,olives, citrus fruits, raisins, and figs. Sheep constitute the major livestock item. The major minerals are bauxite, lignite, magnesite, iron ore and zinc which she also exports. Chief exports are tobacco, olives and olive oil, figs and citrus fruits, and also manufactured and handicraft items such as textiles, cement, chemicals and pharmaceuticals, aluminium, nickel, metals and metal items, furs, etc. In merchant shipping, Greece owns a surprisingly big tonnage with 51,532,510 gross in 1979. Tourism is Greece's biggest industry and it brought in an income of nearly 1,662 million dollars in 1979

GRENADA

Cap: St. George's; **Area**: 344 sq.km.; **Lang**: English and French—African patois; **Rel**: Christian; **Ex. R**: 2.7000 Dollar = US $ 1.

Grenada is the southernmost of British Windward Islands and includes *Southern Grenadines* (islands), the largest of which is *Carriacou*. It is a heavily wooded contry, with mountains of volcanic origin stretching from north to south. Grenada, originally a British colony, became independent in 1974.

Tourism is a growing industry but agriculture dominates the economy. The chief exports are cocoa, nutmegs and bananas. Other crops include coconuts, citrus fruits, sugar cane, cotton and spices. The population is of mixed origin, European, Negro and Carib Indians.

GUATEMALA

Cap: Guatemala City; **Area**: 101,889 sq. km.; **Lang**: Spanish (official) and Indian dialects; **Rel**: Christian; **Ex. R**: 1.0000 Quetzal = US $ 1.

A republic of Central America, Guatemala is bounded by Mexico, Belize, Honduras, El Salvador, the Caribbean Sea and the Pacific Ocean.

Guatemala is the third largest of the five central American states and has the largest population. Fifty per cent of the population is of Indian (Red) extraction, 45 per cent Ladino or of mixed European and Indian parentage. The Indians are the descendants of the builders of the great Maya civilization which was wiped out by the Spanish conquisitadors.

After remaining as a Spanish colony for about three centuries, Guatemala became a republic in 1939. Guatemala's claims to British Honduras (Belize) led to the rapture of diplomatic relations with Britain in 1963.

The soil is very fertile. Agriculture is the most important occupation. The principal crop is coffee. Other important export items are bananas, cotton, gum, sugar, maize, tobacco, fruit and beef. Main industries include food processing, rubber, textiles, paper and pharmaceuticals

GUINEA

Cap: Conakry; **Area**: 245,857 sq. km., **Lang**: French and 8 national languages; **Rel**: Islam and Tribal; **Ex. R**: 20.59 Syli = US $ 1.

Guinea, a former French overeas territory in West Africa, is bounded by Guinea-Bissau, Senegal, Mali, the Ivory Coast, Liberia and Sierra Leone

Under the constitution of the Fifth (French) Republic, Guinea voted for secession and proclaimed itself an independent republic on October 2, 1958.

The chief agricultural products are palmnuts, bananas, coffee, groundnuts and millet. It exports coffee, honey, bananas, palm kernels, iron and aluminium ore. Guinea has probably the world's largest deposit of bauxite. Other minerals are gold, diamonds, uranium, manganese and copper.

GUINEA-BISSAU

Cap: Bissau; **Area**: 36,125 sq. km.; **Lang**: Crioulo (Cape Verde-Guniea dialect) and Portuguese; **Rel**: Islam, Christian and Tribal; **Ex. R**: 36.710 Escudo = US $ 1.

Guinea-Bissau, formerly Portuguese Guinea, is stuck like a wedge between Senegal in the north and Guinea to the east and south. The Atlantic sea borders it on the west. The land is part plain and part plateau.

The main occupation is agriculture. Swamp rice (grown in the coastal plains), coconuts, cassava, sweet potatoes and maize form the important food crops. The cash crops are groundnuts, coconuts and palm oil. Cattle raising is widespread. Minerals like oil and bauxite are found but remain unexploited.

Guinea-Bissau unilaterally declared independence in 1973. Portugal recognised its independence in 1974.

GUYANA

Cap: Georgetown; **Area**: 214,969 sq. km; **Lang**: English (official) and Urdu; **Rel**; Christian and Hindu; **Ex. R**: 2.5500 Dollar = US $ 1.

Guyana (former British Guiana) lies on the north east coast of South America. It is bounded on the east by Suriname, on the west by Brazil and Venezuela, and on the south by Brazil.

Guyana became a British possession in 1814 and an independent sovereign state within the Commonwealth of Nations on May 26, 1966

The economy is based on agriculture. Sugar, rice and bauxite are the main exports. There are considerable deposits of gold and diamonds. Dense tropical forests cover much of the land

HAITI

Cap: Port-au-Prince; **Area**: 27,750 sq km.; **Lang**: French (official), a Creole dialect is generally spoken; **Rel**: Christian and Voodoo; **Ex. R**: 5.0000 Gourde = US $ 1.

Haiti is part of the West Indies island known as Hispaniola in the Atlantic lying between Cuba on the west and Puerto Rico on the east. Negroes form the majority of the population, the rest being mulattos descended from former French settlers and slaves. For some time the French colony Haiti proclaimed itself an independent republic in 1804.

Coffee is the chief agricultural product, others being sisal, cotton, raw sugar, cocoa and tobacco. Rice is grown for home consumption. Rum and other spirits are distilled from molasses and exported. Bauxite is the chief mineral exported. Tourism is Haiti's second largest source of foreign exchange.

HONDURAS

Cap: Tegucigalpa, D. C.; **Area**: 112,088 sq. km.; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 2.0000 Lempira = US $ 1.

Honduras is a republic of Central America lying between Nicaragua, El Salvador and Guatemala. It has a long northern coastline on the Caribbean and a narrow southern outlet to the Pacific.

Originally a Spanish colony, Honduras became independent in 1821. The country has gone through a series of dictatorships, military juntas, coups and counter-coups in the last several years

The chief crop is bananas which constitute 65 per cent of the country's exports. Coffee, cotton, maize and tobacco are also grown. Timber is abundant and cattle raising is a major occupation. The mineral wealth of the country consists of gold, silver, lead and zinc. Deposits of copper and iron ore remain largely un-exploited

HONG KONG

Cap: Victoria; **Area**: 1051.7 sq. km., **Lang**: English and Cantonese; **Rel**: Confucianism and Buddhism; **C. U**: Dollar.

Lying along the south east coast of China, at the mouth of the Canton river, Hong Kong comprises Hong Kong island, Kowloon peninsula, the New Territories and over 230 small islands Hong Kong has been a British colony since 1843. The New Territories were acquired by Britain in 1898 by lease for 99 years.

The pride of Hong Kong is its magnificent harbour between the Kowloon peninsula and the city of Victoria. It functions as one of the world's greatest transhipment ports

The population is almost entirely Chinese with a sprinkling of other nationalities. Since the Second World War, Hong Kong has emerged as an industrial state. Hong Kong specialises in light industries—cotton textile, plastics, electronic, photographic and optical equipment etc.

Food cultivation is limited but production of fruit and vegetables is extensive. Pigs and poultry come next. Marine fisheries are well exploited and inland fisheries give excellent harvests.

HUNGARY

Cap: Budapest; **Area**: 93,033 sq. km.; **Lang**: Hungarian, Magyar; **Rel**: Christianity; **Ex. R**: 24.97 Forint = US $ 1.

Hungary, a socialist country in Central Europe, lies between Czechoslovakia, Yugoslavia, the USSR, Romania and Austria. The eastern half of Hungary is mainly a great fertile plain, 'the Great Plain'. The west and north are hilly.

Hungary had a stormy history being successively overrun by Huns, Magyars, Turks, Hungarians and Austrians. Hungary became an independent republic in 1918 and the Hungarian Socialist Republic in 1919.

Although an agricultural country in the past, industry has come to account for more than half of its total economy since the Second World War. Hungary exports engineering products, machine tools, motor vehicles and electrical and electronic goods. Chief imports are iron ore, coal, crude oil and consumer goods. More than 97 per cent of agricultural land is collectivised. Vineyards occupy around 186,000 hectares.

ICELAND

Cap: Reykjavik; **Area**: 102,846 sq. km; **Lang**: Icelandic; **Rel**: Christian; **Ex. R**: 6.723 Krona = US $ 1.

Iceland is an island close to the Arctic Circle in the North Atlantic. The Norwegian Sea is on the eastern side of Iceland. The warm Gulf Stream makes the winters mild. During the short cool summers, there is perpetual daylight for many weeks—making it an island of the

Midnight Sun. The island has many geysers and hot springs. Natural hot water from Iceland's hot springs is pumped into towns, providing heat for offices and residences. Iceland has over 200 volcanoes, many of them still active.

The people of Iceland are the descendants of the dare-devil Vikings of Norway, the first of whom settled in Iceland in A.D. 874 and who are reputed to have first discovered Greenland (A.D. 982) and North America (A.D. 1000). After having been independent till the 13th century it became part of Norway, and passed under Danish rule. In 1941 the Althing (Parliament) voted for complete independence and a republic was formed on June 17, 1944.

Much of the land in Iceland is uncultivated. Potatoes and turnips are the major crops. Fishing industry is highly developed and forms the mainstay of Iceland's economy. This industry is so vital that Iceland unilaterally extended its fishery limits to 50 nautical miles in 1972 and 200 nautical miles (370 km) in 1975 to eliminate foreign competition.

INDIA
(See Part III)

INDONESIA

Cap: Jakarta. **Area**: 1,904,569 sq. km., **Lang**: Bahasa Indonesian; **Rel**: Islam; **Ex. R**: 629.0 Rupiah=US $ 1.

Indonesia is an archipelago state consisting of over 13,000 (6000 inhabited) islands. The five main islands are Java, Sumatra, Kalimantan (Indonesian Borneo), Sulawesi and Irian Jaya (West New Guinea) with 30 smaller archipelagoes. Total land area is 735,000 sq. miles; total sea area is about four times larger than the land area. The capital is Jakarta the former city of Batavia, on the island of Java. The country is divided into 27 provinces for administrative purposes.

Table 63

Provinces of Indonesia

	Area (sq. mi.)	*Capital*
Borneo (Kalimantan)	208286	
Central Kalimantan	—	Palangkaraya
East Kalimantan	—	Samarinda
South Kalimantan	—	Bandjarmasin
West Kalimantan	—	Pontianak
Celebes (Sulawesi)	72987	
Central Sulawesi	—	Palu
North Sulawesi	—	Manado
South Sulawesi	—	Ujung Pandang
Southeast Sulawesi	—	Kendari
Java (Djawa)	48763	
Central Djawa	—	Semarang
East Djawa	—	Surabaja
Djakarta	—	Jakarta
Jogjakarta	—	Jogjakarta
West Djawa	—	Bandung
Lesser Sunda Islands (Nusatenggara)	36179	
Bali	—	Denpasar
East Nusatenggara	—	Kupang, Timor
West Nusatenggara	—	Mataram, Lombok
Loro Sae (East Timor)	—	Dili
Moluccas (Maluku)	28766	Ambon
Sumatra (Sumatera)	182860	
Atjeh	—	Banda Atjeh
Bengkulu	—	Bengkulu
Djambi	—	Djambi
Lampung	—	Tandjung-Karang Teluk-betung
North Sumatera	—	Medan
Riau	—	Pakanbaru
South Sumatera	—	Palembang
West Sumatera	—	Padang
West New Guinea (Irian Jaya)	151789	Kotabaru

The Japanese army occupied Indonesia from 1942 till 1945 after the surrender of the Dutch army. The Indonesian people proclaimed their independence on August 17, 1945. After a war of independence, the Netherlands transferred the sovereignty to Indonesia on December 27, 1949.

One of the world's richest countries in natural resources, Indonesia has vast supplies of tin, oil and fairly big deposits of bauxite, copper, nickel, gold and silver. Crude oil production is estimated to be about 80 million metric tons per year. Indonesia is second only to Malaysia in tin production. Agriculture is the main occupation of the people. Crops include rice, tobacco, coffee, rubber, pepper, kapok, coconut, palm oil, tea and sugarcane. Industries include petroleum refining, iron and steel, fertilizers, pharmaceuticals, paper, cement, textiles and garments, sugar, furniture and sawn timber. Forest products are a major source of foreign exchange.

IRAN

Cap: Teheran; **Area**: 1,648,000 sq. km., **Lang**: Persian (Farsi); **Rel**: Islam;

Ex. R: 76.854 Rial = US $ 1.

Iran (Persia) is surrounded by Iraq and Turkey in the west, USSR in the north, Afghanistan and Pakistan in the east and Persian Gulf in the south west. The southern coast of the Caspian Sea lies to the north of the country. The Iranians are Aryans

It is a country of great antiquity, celebrated alike for its culture and military valour

The last of the Pahlavi dynasty Mohammed Reza was forced to flee Iran in face of a nation-wide revolt against him. In Feb. 1979 Ayatullah Khomeini, a high priest of Islam, returned to Iran to guide its destiny

Agriculture is the major occupation of the people. The chief agricultural products are wheat, barley, rice, fruits, wool and sugar beets. Sturgeon fish (from which caviar is obtained) in Caspian Sea provides an important source of income. Iran is one of the biggest oil producing regions in the east. Other mineral resources include copper, lead, coal, iron ore, chromite and zinc. Emeralds and other gems are found in Khorassan and Kerman. Persian carpets, made on handlooms and famous the world over, are produced in Kerman, Qum, Tabriz, Arak, Meeshed, Isfahan and Kashan.

IRAQ

Cap: Baghdad; **Area**: 438,446 sq. km. **Lang**: Arabic (official) and Kurdish, **Rel**: Islam, **Ex. R**: 0.29532 Dinar = US $ 1.

Iraq is the modern name for Mesopotamia (Meso - middle, Potamia - rivers), the land lying between the two great rivers, Euphrates and Tigris. It is surrounded by Iran on the east, Saudi Arabia, Kuwait and the Arabian (Persian) Gulf on the South, Jordan and Syria on the west and Turkey on the north.

Iraq is one of the most ancient countries of the world and has produced a culture—the Mesopotamian Civilisation—which has influenced European and Asian civilisations.

Petroleum is the most important sector of the economy. Iraq occupies the fifth place among oil-producing countries of the world. A programme of industrialisation has been started with the oil revenues. Three-quarters of the population depend on agriculture for their living. Iraq is the world's largest exporter of dates.

IRELAND

Cap: Dublin, **Area**: 70,282 sq km; **Lang**: Irish and English; **Rel**: Christian; **Ex. R**: 0 7 Irish Pound = US $ 1.

Ireland or Eire, the Emerald Isle, is an island in the N. Atlantic lying west of Great Britain.

The independent state of Ireland consists of only 26 counties out of the 32 that make up the whole island. The 6 remaining counties form the area known as Northern Ireland which is directly administered by the United Kingdom.

Ireland emerges into history with the coming of St. Patrick in 432 A.D. and the spread of Christianity. *An invasions led by Norman barons during the 12th century led to a period of almost eight centuries of British rule in Ireland.* In 1921 Great Britain recognised Ireland as a more or less independent unit within the Commonwealth and the country became known as the Irish Free State. In 1932 the Fianna Fail party under Eamon de Valera came to power and gradually removed the last vestiges of allegiance to the British Crown. In 1937 a new constitution was adopted which made Ireland effectively a republic. In 1949 Ireland formally declared itself a Republic and ceased to be a member of the Commonwealth. In 1973 the country joined the European Economic Community (EEC).

Ireland had formerly a mainly agricultural economy. However, in recent decades industrial output has expanded rapidly due to increased foreign investment. Among the industries showing most rapid growth are electronics, computers, chemicals, textiles, metals, engineering and food. Dairying is the main agricultural activity while the principal crops are wheat, barley, oats, fruits and vegetables. Exports now make up 50% of GNP, the main items being dairy products, food and beverages, machinery and live animals. Manufactured items now constitute 58% of the total value of Irish exports

ISRAEL

Cap: Jerusalem; **Area**: 20,325 sq km; **Lang**: Hebrew (official) and Arabic, **Rel**: Judaism, **Ex. R**: 8 870 Shekel = US $ 1

A republic of the Middle East (West Asia), Israel is surrounded on three sides by Arab countries. On the north is Lebanon, on the east Syria and Jordan and on the south Egypt. The Mediterranean Sea lies to the west.

The republic occupies the minor portion of ancient Palestine.

On November 29, 1947, the UN partitioned Palestine between the Jews and the Arabs. A new Zionist state called Israel was proclaimed in the Jewish area of Palestine on May 15, 1948.

Israel has developed both agriculture and industry in the little land allotted to it with considerable expertise and efficiency. They have literally made the deserts bloom. Kibbutzim (collective cultivation), irrigation schemes and reclamation of desert-land formed the main features of agricultural development. Citrus fruits are the main exports. Wine-making is an extensive industry. In diamond-cutting, Israel comes next only to Belgium. The Valley of Jordan and the Dead Sea yield rock salt, sulphur and potash.

ITALY

Cap: Rome; **Area**: 301,253 sq. km; **Lang**: Italian; **Rel**: Christian; **Ex.R**: 1102.0 Lira = US $ 1.

The Italian Republic occupies the long peninsular area in Europe extending from the Alps into the Mediterranean Sea. The peninsula is bounded by the Mediterranean on 3 sides. France bounds it on the north-west, Switzerland and Austria on the north and Yugoslavia on the north-east. The islands of Sicily, Sardinia, Elba and Capri in the Mediterranean belong to Italy.

Italy, once the headquarters of the great Roman Empire, disintegrated into many petty states during the later Middle Ages. Modern Italy began to develop when King Victor Emmanuel II of Savoia became King. The Vatican was recognised as an independent state on February 11, 1929. On April 28, 1945 Mussolini the Fascist dictator was put to death. Consequent on a referendum on June 2, 1946, Italy voted for a republic. The King laid down his kingship.

Since World War II, Italy has revolutionised agricultural production. The chief crops are grapes, wheat, sugarbeet, fruit and vegetables. Italy is among the highly industrialised countries of the world. Its main products are electrical, mechanical and electronic gadgets, automobiles and chemicals. Italy has a big merchant marine fleet with a gross tonnage of over 11 million, and air fleet with the capacity of over 12 billion passengers/km and over 1 billion tons/km.

THE IVORY COAST

Cap: Abidjan; **Area**: 322,462 sq. km; **Lang**: French (official) and Tribal; **Rel**: Muslim and Christian; **Ex. R**: 262.7 CFA Francs = US $ 1.

The Ivory Coast is bordered by Mali and Upper Volta in the north, Ghana in the east, the Gulf of Guinea in the south, and Liberia and Guinea in the west.

The Republic of Ivory Coast, once an overseas territory of France, became independent in August 1960.

Agriculture, forestry and fishing employ 90 per cent of the population. Ivory Coast is the third most important coffee producer in the world and the most important African producer of timber. Cocoa, bananas and pineapples are the other important cash crops. Manganese and diamonds are mined but other minerals remain unexploited.

JAMAICA

Cap: Kingston; **Area**: 10,991 sq. km; **Lang**: English; **Rel**: Christian; **Ex. R**: 1.7816 Dollars = US $ 1.

Jamaica, an island in the Greater Antilles group of the West Indies, is situated in the Caribbean Sea, 90 miles south of Cuba. The climate varies with altitude, being tropical at sea-level and temperate in the mountain area.

Jamaica was visited by Columbus in 1494 and ruled by Spain till 1655 when Britain occupied it. In 1962 Jamaica became fully independent as a member of the Commonwealth.

Agriculture, mining and tourism form the backbone of the economy. The dominant crop is sugar, with molasses and rum as important by-products. Bananas, citrus fruits and coconuts are also grown. Jamaica is the world's second largest producer of bauxite and alumina. Other industries are cement, tobacco and consumer goods.

JAPAN

Cap: Tokyo; **Area**: 377,535 sq. km; **Land**: Japanese; **Rel**: Shinto and Buddhist; **Ex. R**: 215 Yen=US $ 1

Japan consists of four main islands Honshu (Mainland), Hokkaido, Kyushu and Shikoku and a number of smaller islands of which Okinawa is one. Japan is separated from the Soviet Union and

Korea by the Sea of Japan and from China by the East China Sea. Japan has a deeply indented coastline measuring 16,654 miles, Most important ports are Yokohama, Kobe, Nagoya and Osaka.

Table 64
Main Islands of Japan

Name	*Area (sq. km.)*	*Major City*
Honshu	227,414	Tokyo
Hokkaido	78,073	Sapporo
Kyushu	36,555	Kitakyushu
Shikoku	18,257	Matsuyama

Legend has it that the Japanese Empire was founded by Emperor Jimmu in 660 B.C. However, there was no centralised authority till A.D. 1868 when Emperor Meiji united the whole of Japan under his rule. Japan had little trade relations with foreign countries until Commodore Perry of USA in 1854 persuaded the Japanese to enter into a trade treaty with USA. In 1889 Japan had her first constitution. Japan's victory in the Russo-Japanese War of 1904-05 raised her prestige among European powers.

Rice, the staple food of Japan, is cultivated in half the area of arable land. Other crops are wheat, barley, potatoes, and tobacco. Except for limestone and sulphur, Japan is poor in minerals and Japanese industry is heavily dependent on imported raw materials and fuels. Japan is one of the most industrially advanced countries of the world. The principal industries are motor vehicles, iron and steel, chemicals, textiles (cotton, wool, silk and synthetics), fishing, ceramics, precision instruments, fertilizers, machinery and shipbuilding. Japan has evolved an extensive fishing industry.

JORDAN

Cap: Amman; **Area**: 97,740 sq. km; **Lang**: Arabic; **Rel**: Islam; **Ex. R**: 0.32750 Dinar=US $ 1.

A constitutional monarchy in South-West Asia, Jordan is bounded in the north by Syria, north east by Iraq, east and south by Saudi Arabia and west by Israel.

Jordan was popularly known as Trans-Jordan till 1949, when the popular name was changed to the Hashemite Kingdom of Jordan. The population is chiefly Arab of whom the majority are Muslims. In 1946, Jordan became an independent state.

Jordan is largely a desert area, but the western portion is fertile and produces citrus fruits, wheat, barley, lentils, and water melons. Phosphates make up the country's most important export item, but tourism remains its main foreign exchange earner.

KAMPUCHEA

(Cambodia)

Cap: Phnom-Penh; **Area**: 181,035 sq. km; **Lang**: Khmer; **Rel**: Theravada Buddhism; **C. U**: Riel.

The Democratic Kampuchea was originally called Cambodia and for some time—between Oct. 1970 and May 1975—was known as Khmer Republic. It is a south-east Asian state bounded by Thailand and Laos on the north, by Vietnam on the east and south and by the Gulf of Siam on the south and west. Democratic Kampuchea represents the last remains of the great Khmer Empire.

Kampuchea is an undeveloped country with 50 per cent of its land covered by virgin forests. Rice occupies 80 per cent of the cultivated area. Cattle rearing and fishing are fairly well developed. The forests are rich in valuable timber. Iron, copper, manganese and gold are also found.

KENYA

Cap: Nairobi; **Area**: 582,646 sq. km.; **Lang**: Swahili; **Rel**: Tribal and Christian; **Ex. R**: 8.2914 Shilling=US $ 1.

The Republic of Kenya is bordered on the north by Sudan and Ethiopia, east by Somalia and the Indian Ocean, south by Tanzania and west by Uganda.

Formerly a British colony, Kenya became an independent republic within the Commonwealth in 1964.

Kenya's prosperity rests largely on agricultural products. The chief cash crops are coffee, tea, sisal, cereals, wattle, and pyrethrum. Kenya is one of the few African countries with an important dairy industry. Mineral industries are being organised. Tourism has expanded considerably.

KIRIBATI

(Gilbert Islands)

Cap: Tarawa; **Area**: 861 sq. km; **Lang**: Gilbertese and English; **Rel**: Christian; **C. U**. Dollar.

Gilbert Islands, till recently a British colony, became independent under the name Kiribati (pronounced Kiribas) on July 11, 1979

These islands, spread over a vast area in Western Pacific, number around 33. All islands except Ocean Island (Banaba) are low atolls with coconuts, pandanus and bread fruit forming the main vegetation. The population is Micronesian and Polynesian. Agriculture and fishing are the main occupations. Ocean Island has high grade phosphatic deposits which are being mined and exported. Copra is the other major export item (Also see *Tuvalu* infra).

KOREA (NORTH)

Cap: Pyongyang; **Area**: 120,538 sq. km; **Lang**: Korean; **Rel**: Buddhist and Confucian; **C. U.** Uton.

The Democratic People's Republic of Korea occupies the northern part of the Korean peninsula. It lies between the Yellow Sea and the Sea of Japan. China is in the north.

During the Second World War, America occupied South Korea and Russia, North Korea. At the Potsdam Conference, the 38th parallel of latitude was recognised as the line of division between the occupation areas of Russia and America. North Korea was formed into the Democratic People's Republic of Korea on Sept. 9, 1948.

With the formation of the republic in 1948, all industry was nationalised and land distributed among the peasants. Agriculture has since been collectivised. Industrial development has concentrated on heavy industry, electricity, metallurgy, machinery and chemicals. The country is rich in coal and iron and many non-ferrous metals. It is one of the five leading countries of the world in the production of tungsten, graphite and and magnesite.

KOREA (SOUTH)

Cap: Seoul; **Area**: 98,859 sq. km; **Lang**: Korean; **Rel**: Christian and Confucianism; **Ex. R**: 678.9 Won = US $ 1.

The Republic of Korea forms the southern part of the Korean peninsula. It is bounded on the north by the Democratic People's Republic of Korea, on the east by the Sea of Japan and on the west by the Yellow Sea. The republic of Korea was formally proclaimed on August 15, 1948.

Agriculture is the mainstay of the economy. The chief crop is rice. Wheat, barley and potatoes are also cultivated. Fish is both an export item and a source of food. There are substantial coal deposits. Other minerals include iron, tungsten, graphite and fluorite. New industries have been started, notably in textiles, electronics, steel and petrochemicals.

KUWAIT

Cap: Kuwait City; **Area**: 17,656 sq km ; **Lang**: Arabic and English; **Rel**: Islam; **Ex. R**: 0.27591 Dinar = US $ 1

Kuwiat, a small Arab state, is on the north western coast of the Persian Gulf between Iraq and Saudi Arabia. With a per capita income of US dollars 15,970 (1978), Kuwait is one of the richest countries in the world

Kuwait was traditionally under the rule of the Al-Saban dynasty, founded in 1756. It became an independent state on June 19, 1961.

Petroleum is the country's only economic asset but a gigantic one. Kuwait is the world's fourth largest producer of petroluem.

LAO PEOPLE'S DEMO. REP.

(Laos)

Cap: Vientiane; **Area**: 236,880 sq. km.; **Lang**: Laotian & Tribal; **Rel**: Buddhist; **C.U**: Kip.

Laos occupies a strategic position in South East Asia, bounded on the north by China, on the east by Vietnam, on the south by Kampuchea, on the west by Thailand and on the north west by Burma. Laos became an independent republic in 1949

The chief products are rice, tobacco cotton, benzoin and shellac, tin, lead, zinc and teak wood. Other industries exist but on a very small scale

LEBANON

Cap: Beirut; **Area**: 10,400 sq. km : **Lang**: Arabic; **Rel**: Christian and Muslim. **Ex. R**: 3 970 Pounds = US $ 1

The Republic of Lebanon [illegible]pies a strip of land along the Mediterranean coast between Syria and Israel Lebanon became independent in 1941

Primarily an agricultural country, Lebanon produces olive oil, grain and fruits The chief Lebanese industries are oil refining, food processing and cement. Tourism is a valuable source of income

LESOTHO

Cap: Maseru; **Area**: 30,355 sq. km.; **Lang**: English and Sesotho; **Rel**: Christian and Tribal. **Ex. R**: 0.81927 Rand=US $ 1

The Kingdom of Lesotho is an enclave within the Republic of South Africa. Lesotho was a British protectorate under the name Basutoland. It became independent as Lesotho on Oct. 4, 1966.

The principal occupation is agriculture. Lesotho possesses water and hydro-electric resources of great potential. Live-stock, diamonds, wool and mohair are the main exports

LIBERIA

Cap: Monrovia; **Area**: 111,369 sq. km; **Lang**: English and Tribal; **Rel**: Christian; **Ex. R**: 1.0000 Dollar=US $ 1

This independent republic lies on the Atlantic coast, with Sierra Leone on the north-west, Guinea on the north and Ivory Coast on the east.

Liberia wa founded in 1822 and declared a republic on July 26, 1847

About 90 per cent of the population is engaged in agriculture, much of it at subsistence level. Main crops are cassava, coffee, cocoa and palm oil. Iron ore and rubber are the main exports.

LIBYA ARAB JAMAHIRIYA

Cap: Tripoli; **Area**: 1,759,540 sq. km.; **Lang**: Arabic; **Rel**: Islam; **Ex. R**: 0.29605 Dinar=US $ 1.

The Libyan Arab Republic changed its name to Jamahiriya meaning State of the Masses in March 1977. An Arab state on the north coast of Africa, Libya is bounded by Egypt, Sudan, Tunisia, Algeria, Niger and Chad

Formerly an Italian colony, Libya became an independent state in 1949.

The main agricultural products are dates, olives, almond and citrus fruits. Fishing, tobacco processing, dyeing and weaving are the important industries. Oil was discovered in 1957 and today Libya is one of the leading producers of oil in the world.

LIECHTENSTEIN

Cap: Vaduz; **Area**: 160 sq. km.; **Lang**: German; **Rel**: Christian; **C.U**: Franken

Liechtenstein is a small state on the Upper Rhine, between Austria and Switzerland. It measures 24 km from north to south and 9 km from east to west. It became an independent kingdom in 1866.

The economy is mainly industrial. Chief industries are machines and tools, textiles, foodstuffs, and leatherware

LUXEMBOURG

Cap: Luxembourg-ville (Lutzelburg); **Area**: 2586 sq. km.; **Lang**: French; **Rel**: Christian. **Ex. R**: 36.03 Francs=US $ 1.

Luxembourg is a small state lying in between Germany, Belgium and France. It is a Grand Duchy.

Its independence was confirmed by the Treaty of London in 1867.

As a member of the European Economic Community, the Benelux, the European Steel and Coal Community and the Euratom, Luxembourg is a highly industrialised state. Its iron deposits form the basis of a big steel industry, which accounts for 70 per cent of the country's exports. Agriculture occupies only 10 per cent of the population.

MACAO

Cap: Macao; **Area**: 15.5 sq. km.; **Lang**: Portuguese and Cantonese; **Rel**: Confucian; **C.U**: Pataca.

Macao or Macau is a tiny portuguese possession in South China, at the mouth of the Sinkiang river. The territory consists of the Macao peninsula and the adjoining islands of Taipa and Coloane. China has permitted Macao to continue as an independent territory mainly because of the big entrepot trade it commands. Macao is a free market for gold and an infamous centre of smuggling and gambling

The population is almost entirely Chinese. Industry, once restricted to matches and fireworks, now includes plastics, textiles, cameras, binoculars and such other consumer items. Cultivation is sparse. Only rice and vegetables are grown

MALAYSIA

Cap: Kuala Lumpur; **Area**: 330,435 sq km.; **Lang**: Bahasa Malaysia; **Rel**: Muslim, Buddhist; **Ex. R**: 2.316 Ringgit=US $ 1

Malaysia consists of 11 Malaysian states and the Borneo states of Sarawak and Sabah (North Borneo). Malaya, on the Malay Peninsula, is bordered on the east by the South China Sea, on the south by the Straits of Johore, on the west by the Straits of Malacca and the Andaman Sea, and on the north by Thailand The population of Malaysia is mixed The Malays proper account for about 54.1 per cent of the population, the Chinese for about 33 4 per cent and the Indian for about 10.1 per cent and 1 4 per cent others. The Federation of Malaysia was formally inaugurated in 1963

Malaysia is the world's leading producer of rubber and also the world's major producer of tin, providing about 40 per cent of the world output. Iron ore, gold, ilmenite and bauxite form other major mineral resources. Oil production is becoming important. Industries include textiles, electronic equipment, chemicals and machinery

THE MALAGASY REPUBLIC
(MADAGASCAR)

Cap: Tananarive; **Area**: 587,341 sq. km.; **Lang**: Malagasy and French; **Rel**: Islam; **Ex. R**: 262.7 Francs = US $ 1.

The Malagasy Republic, formerly the French overseas territory of Madagascar, is a large island about 500 km long off the coast of Mozambique. It became independent in 1960.

The economy is essentially agricultural. Rice is the staple food and coffee the chief export. Tobacco, cloves and vanilla are also cultivated. Large herds of cattle are raised. Mineral deposits include graphite, mica, nickel and copper. Since 1960, chromite is being mined.

MALI

Cap: Bamako; **Area**: 1,239,998 sq. km.; **Lang**: French (official), **Rel**: Muslim and Tribal, **Ex. R**: 525 4 Francs = US $ 1

Mali is a land-locked state in West Africa, bounded by Algeria on the north, Mauritania and Senegal on the west, Guinea and Ivory Coast on the south and Upper Volta and Niger on the east. It was proclaimed an independent republic in 1960

The country is poor in natural resources Only about 20 per cent of the land is cultivable The main crops are rice, millet and groundnuts Livestock-raising is important and the processing of hides and skins remains the only industry There is extensive river-fishing and good export trade in dried and smoked fish

MALTA

Cap: Valletta; **Area**: 316 sq. km.; **Lang**: Maltese and English; **Rel**: Christian; **Ex. R**: 0.38739 Pounds = US $ 1.

Malta is an island in the central Mediterranean Sea, 58 miles from Sicily and about 180 miles from the African coast. This state also includes the adjoining islands of Gozo and Comino. Malta became an independent republic in 1964.

The rocky country has no natural resources. Textiles, footwear, rubber products and plastics are now exported. Agricultural products include onions, potatoes and tomatoes. Tourism, however, remains the island's major industry.

MALAWI

Cap: Licongwe; **Area**: 118,784 sq. km; **Lang**: English and Chichewa; **Rel**: Tribal and Muslim, **Ex. R**: 0.87400 Kwacha = US $ 1.

Malawi is bounded by Tanzania, Mozambique and Zambia. Lake Nyasa lies on its eastern side. A land of lakes and mountains, Malawi has infinite beauty and is considered a tourists' paradise. Malawi, formerly Nyasaland, became independent in 1966.

Poor in resources, Malawi's agriculture is still at a subsistence level. The chief cash crops are tea and tobacco, sugar and cotton.

MALDIVES

Cap: Male; **Area**: 298 sq. km; **Lang**: Divehi; **Rel**: Islam; **Ex. R**: 7.5500 Rupees (1979) = US $ 1.

Maldives (literally, islands of Male—from the Sanskrit 'dweep' meaning island) is an archipelago in the Indian Ocean, to the southwest of India and west of Sri Lanka. The archipelago consists of 12 coral atolls and about 2000 small islands It extends for about 300 miles north to south

The Maldives attained independence on July 26, 1965. It became a republic in November, 1968

Most of the people are seafarers Coconuts, fruits and millet are the main crops. The chief occupation is fishing and production of processed fish is the main industry.

MAURITANIA

Cap: Nouakchott; **Area**: 1,030,700 sq km; **Lang**: Arabic and French (official),

Rel: Islam; **Ex. R**: 47.58 Ouguiya=US $ 1.

The Islamic Republic of Mauritania is on the Atlantic coast of the West African bulge. It is bordered by Morocco, Algeria, Mali and Senegal.

Mauritania, a former French overseas territory, became autonomous in 1958 and fully independent in 1960.

The population is traditionally nomadic rearing cattle and sheep. Fishing is important. Important deposits of iron and copper have been sighted and are being exploited. Oil prospecting goes on

MAURITIUS

Cap: Port Louis; **Area**: 2040 sq. km; **Lang**: English, French and Hindustani; **Rel**: Hindu, Christian and Muslim; **Ex. R**: 8.3265 Rupees=US $ 1.

Mauritius lies about 500 miles east of Malagasy in the Indian Ocean.

It became an independent state on March 12, 1968.

The island is an extreme example of a one-crop economy, sugarcane being the only crop that supports the economy. Molasses, tea and tobacco are exported. In recent years, rapid advance has been made in the field of import substitution and export oriented industries.

MEXICO

Cap: Mexico City; **Area**: 1,972,547 sq. km; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 23.987 Peso=US $ 1.

A federal republic of middle America, Mexico is bounded by the US, Belize and Guatemala. The Gulf of Mexico and the Gulf of Campeche are in the east while the Pacific Ocean and the Gulf of California are in the west. Mexico became an independent state in 1911.

Mexico is well suited for agriculture but is obliged to import food. The important agricultural products are maize, rice, wheat and sugar. Sea fishing is also important as an occupation. Mexico is one of the world's leading producers of silver and sulphur. Other minerals include coal, zinc, lead, manganese, bauxite and uranium

MONACO

Cap: Monte Carlo; **Area**: 1.81 sq. km; **Lang**: French & Monegasque; **Rel**: Christian; **C. U**: Franc.

Monaco is a sovereign principality on France's south-eastern Mediterranean coast.

The principality is a series of connected towns—Monaco-Ville, La Condamine, Fontvieille and Monte Carlo with its casino, opera house, grand hotels, shops and villas.

Monaco is a fashionable pleasure resort visited by thousands of tourists every year. Its main attractions are the gambling casino and its international motor sports—the Monte Carlo Rally and the Monaco Grand Prix. Tourism, gambling, taxes and tobacco monopoly are its main sources of income.

MONGOLIA

Cap: Ulan Bator; **Area**: 1,565,000 sq. km, **Lang**: Mongolian, **Rel**: Buddhist and Lamaism; **Ex. R**: 3.05 Tugrik=US $ 1.

The Mongolian People's Republic lies in Central Asia with the Soviet Union to the north and China to the south, east and west. It became an independent state in 1921.

Livestock-raising is the principal occupation and comprises horses, oxen, sheep, goats and camels. The herdsmen are organised in collectives. State farms, of which there were 49 in 1980, practise large-scale agriculture. Minerals include coal, flourspar, tungsten, tin and copper.

MONTSERRAT

Cap: Plymouth; **Area**: 102 sq. km; **Lang**: English and Patois; **Rel**: Christian **C. U** Dollar.

Montserrat, like Antigua, is one of the Leeward Islands. Its population is of mixed European-Negro origin. Europeans proper form a minority. Agriculture is the mainstay of the people. Sea island cotton and vegetables like tomatoes form the main exports.

It is a British Associate State with full internal autonomy.

MOROCCO

Cap: Rabat; **Area**: 800,000 sq. km; **Lang**: Arabic; **Rel**: Islam; **Ex. R**: 5.0263 Dirham=$ 1.

The Kingdom of Morocco, which is a constitutional, democratic and social Monarchy, is situated at the extreme northwest of Africa. It is bordered by Algeria in the east and Mauritania in the south, the North Atlantic Ocean in the west and the Mediterranean Sea in the north. The Atlas mountains stretch across Morocco.

Morocco recovered its political independence from France on March 2, 1956, and gained control over the Northern Spanish zones in 1958.

Primarily an agricultural country, Morocco produces cereals, including barley, wheat and corn. Vineyards are abundant and dates form a regular crop. Livestock raising is important and fishing is well-developed. The most important mineral extracted is phosphate, of which Morocco remains a world supplier. Other minerals are iron ore, coal, lead and manganese.

MOZAMBIQUE

Cap: Maputo; **Area**: 783,030 sq. km; **Lang**: Portuguese, Bantu; **Rel**: Muslim and Christian; **Ex. R**: 49.308 Escudo (1980)=US $ 1.

Mozambique, formerly Portuguese East Africa, has for its neighbours Swaziland on the south, South Africa on the south and west, Zimbabwe, Zambia and Malawi on the west and Tanzania on the north. The Mozambique Channel of the Indian Ocean bounds it in the east. The majority of the population belongs to the *Bantu* tribe.

The economy is based on agriculture. The major cash crops are cashewnuts, sugar, cotton, and sisal. Maize, bananas, rice and coconuts are also grown. Considerable mineral resources exist although only coal, diamonds and bauxite are now exploited. Mozambique has two-thirds of the world's known reserves of tantalite and is the second largest producer of beryl.

NAMIBIA

Cap: Windhoek; **Area**: 824,292 sq. km; **Lang**: English & Afrikaans; **Rel**: Christian and Tribal; **C. U**: Rand.

Namibia, formerly known as South West Africa, lies on the Atlantic coast of Africa. The Atlantic Ocean flanks it on the west, Angola lies to the north, Zambia to the northeast, Botswana to the east, and South Africa to the south and southeast.

The biggest population group is *the Owambos*.

Diamonds are Namibia's most valuable economic asset followed by copper, zinc, lead, germanium and manganese. Stockbreeding is important; cattle, sheep and goats abound. Fishing is a supplementary source of food and income.

Box 31

Namibia

Namib means place of no people, but Namibia is hardly that. It is the home of distinctive tribes—Ovambos, and Hereros, Namas and San, Damaras and Kavengos, Caprivians and Tswanas—each with its own culture and history.

I found white tribes as well, descendants of German, Afrikaner and English settlers. These were people of mixed descent known as Coloureds—among them an aloof and vigorous community at Rehoboth who proudly call themselves Bastards.

It was a land that defied generalisations. "We speak 27 different languages and dialects in Namibia", an anthropologist told me in Windhoek".

Brian Hodgson in National Geographic

NAURU

Cap: Nauru; **Area**: 20.9 sq. km; **Lang**: English and Nauruan; **Rel**: Christian; **C. U**: Dollar.

Nauru is a small island in the central Pacific. It is an oval-shaped coral island of approximately 12 miles in circumference, surrounded by a reef which is exposed at low tide.

Nauru became an independent republic on Jan. 31, 1968.

About four-fifths of the area of Nauru is phosphate-bearing rock. Phosphates form the only [illegible]rt.

NEPAL

Cap: Kathmandu; **Area**: 147,141 sq km; **Lang**: Nepali; **Rel**: Hindu and Buddhist; **Ex. R**: 12.00 Rupees=US $ 1

Nepal is a kingdom in the southern slope of the Himalayas, situated between India and China.

Nepal is rich in forest wealth and quartz deposits. The principal exports are jute, rice, cattle, hides, wheat and herbal drugs.

THE NETHERLANDS

Cap: Amsterdam—The Hague (seat of Government); **Area**: 41,160 sq. km; **Lang**: Dutch; **Rel**: Christian; **Ex. R**: 2.453 Guilder = US $ 1.

The Kingdom of the Netherlands comprises the Netherlands and Antilles. The Netherlands is located in Europe, between Belgium and the Federal Republic of Germany. The country is plainland with an average height of 37ft. above sea-level. Much of the land, however, is below sea level and is protected by dykes, which extend for some 1500 miles.

Agriculture has been mechanised and developed. Foodstuffs form the largest industrial sector. Dairy products account for one-quarter of exports. Other major industries include chemicals, metallurgy, machinery and electrical goods. Amsterdam is famous as a world centre for diamonds, precious metals and art treasures.

NEW ZEALAND

Cap: Wellington; **Area**: 269,057 sq. km; **Lang**: English and Maori dialect; **Rel**: Christian; **Ex. R**: 1.1126 Dollar = US $ 1.

New Zealand, lying in the South Pacific Ocean with Tasman Sea on the west, consists of two large islands, North Island and South Island and numerous small islands. It gained dominion status in 1907.

Primary industries are dairying, meat and wool. The major crops are wheat, oats and barley. Minerals include coal and gold. Pulp and paper industry is highly developed. Iron, steel and aluminium are new industries.

NICARAGUA

Cap: Managua; **Area**: 130,000 sq. km; **Lang**: Spanish, English; **Rel**: Christian; **Ex. R**: 10.050 Cordoba = US $ 1.

Nicaragua is located in the heart of Central America, bordered on the north by Honduras, on the south by Costa Rica, on the east by the Caribbean Sea and on the west by the Pacific Ocean. It became an independent state in 1838.

Agriculture is the principal source of national income. The most important agricultural products are cotton, coffee and sugar-cane. Chief industries are matches, leather, beer and plastic goods. Gold, copper, silver, lead and zinc are found

NIGER

Cap: Niamey; **Area**: 1,267,000 sq. km; **Lang**: French and Hausa; **Rel**: Muslim and Tribal; **Ex. R**: 262.7 CFA Francs = US $ 1.

The Republic of the Niger lies in the heart of West Africa. It is surrounded by Algeria and Libya in the north, Chad in the east, Nigeria and Benin in the south and Upper Volta and Mali in the west.

Formerly part of French West Africa, Niger became fully independent in 1970.

It is an agricultural country with very limited resources. The principal crops are peanuts and cotton. Cattle-breeding is the next most important occupation of the people. Uranium has been discovered and mining is going on.

NIGERIA

Cap: Lagos (Federal); **Area**: 923,768 sq. km; **Lang**: English, Hausa, Ibo and Yoruba; **Rel**: Muslim, Christian and Tribal; **Ex. R**: 0.56977 Naira = US $ 1

The Federation of Nigeria is a West African coastal state within the Gulf of Guinea, with Niger to the north, Benin to the west and Cameroon to the east. River Niger flows through south western Nigeria towards the south where it is joined by its chief tributary the Benue, and empties into the Gulf of Guinea, creating an extensive swampy delta.

Nigeria became an independent state in 1960 and a republic within the Commonwealth in Oct. 1963.

The chief agricultural products are cocoa, palm oil, palm kernels, cotton, rubber, peanuts and skins. Tin, lead, columbite, coal and iron ore represent the chief minerals. There is extensive exploitation of the forest for various timbers. Crude oil exports have become important since 1970. Industry is diversified, beer, cement, cigarettes and aluminium products being the main items

NORWAY

Cap: Oslo; **Area**: 323, 895 sq. km; **Lang**: Norwegian; **Rel**: Christian; **Ex. R**: 5.553 Krone = US $ 1.

Norway extends along the western part of the Scandinavian Peninsula from the Skagerrak which separates it from Denmark to the North Cape in the Arctic Ocean, where it meets Finland and Soviet Russia

Norway is known as the *Land of the Midnight Sun*, because in the North Cape area, the sun does not set from middle May until the end of July, nor does it rise above the horizon from the end of November to the end of January. (see Box Part I)

The important agricultural products are barley, oats, rye and potatoes. Fishing is a mojor occupation with immense quantities of cod, herring, whale, tuna, seal, mackerel and salmon. Forests provide raw material for many industries. Mining is an important industry. There is very little coal but plenty of hydro-electric power to run big factories. the principal manufactures are food products, machinery and metal work, wood, paper and pulp, aluminium and electro-chemical products.

OMAN

Cap: Muscat; **Area**: 300,000 sq. km, **Lang**: Arabic; **Rel**: Islam, **Ex. R**: 0.3454 Rial = US $ 1

The Sultanate of Oman, formerly Muscat & Oman, occupies the south eastern part of the Arabian Peninsula. Its coastline stretches along the Arabian Sea, the Gulf of Oman and the Persian Gulf. Oman adopted the present name in 1970

Where there is water, the land is very fertile. The Batina coastal plain is famous for its dates, fruits and grains. Oil, however, is the ace of the economy.

PAKISTAN

Cap: Islamabad, **Area**: 796,095 sq. km, **Lang**: Urdu, **Rel**: Islam; **Ex. R**: 9.900 Rupees = US $ 1

The Islamic Republic of Pakistan, now confined to West Pakistan, originally came into existence in 1947, following the partition of India into two states, India and Pakistan. Its eastern wing, formerly called East Pakistan, fell apart in 1971. Pakistan is bordered by Afghanistan, Iran, India and China.

Agriculture is the mainstay of Pakistani economy. Wheat, sugarcane, cotton and rice are the major crops. Industries are being developed with indigenous resources and foreign knowhow and assistance. A wide range of minerals like graphite and limestone remain to be exploited

PANAMA

Cap: Panama City; **Area**: 77,082 sq. km; **Lang**: Spanish, **Rel**: Christian; **Ex. R**: 1.0000 Balboa = US $ 1

Panama is a narrow strip of territory at the southern end of the Isthmus separating North and South America. It is situated between Costa Rica and Colombia. The Caribbean Sea is on the north and the Pacific Ocean in the south. At its narrowest point, 50 miles wide, the Atlantic and the Pacific Oceans are united by the famous Panama Canal. It declared itself independent in 1903

Control over the Panama Canal, linking the Atlantic and Pacific Oceans, had long been a bone of contention between the US and Panama. In 1978, it was agreed that the US will relinquish all its claims in favour of Panama at the close of the century.

The soil is extremely fertile but nearly one-half of the land is uncultivated. The chief crops are bananas, coffee and cereals. Industry is mainly centred around sugar and alcoholic beverages. Shrimp fishing is important. There are excellent timber resources, notably mahogany.

PAPUA NEW GUINEA

Cap: Port Moresby; **Area**: 462,840 sq. km; **Lang**: Melanesian and Papuan; **Rel**: Christian and Tribal; **Ex. R**: 0.6665 Kina = US $ 1.

Papua New Guinea comprises the eastern section of the island of New Guinea and adjacent islands.

It is a region of lofty mountains and swampy plains. The surrounding islands are largely of volcanic or coral origin.

The population consists of dark-skinned Melanesians, who live mostly along the coasts and woolly-haired Papuans who inhabit the interior.

Agriculture occupies the majority of the population, most of whom are subsistence farmers. Sago, yams, taro, manioc, and sweet potatoes are the main food crops. Cash crops include coconuts, cocoa, coffee and rubber. The country has large deposits of various minerals. Gold and copper are being mined. Oil and natural gas have also been found.

PARAGUAY

Cap: Asuncion; **Area**: 406,752 sq. km; **Lang**: Spanish, Guarani; **Rel**: Christian; **Ex. R**: 126 Guarani = US $ 1.

Paraguay is one of the landlocked countries of South America surrounded by Bolivia, Brazil and Argentina. The Paraguay river is navigable for some 1800 miles and steamers come up to Asuncion which is the chief port of the state. This makes up for lack of coastline or sea harbours. It became independent in 1811.

About 75 per cent of the population is engaged in agriculture and allied pursuits, with cattle breeding as an important occupation. The most important agricultural crops are corn, cotton, beans, tobacco and citrus fruits. The timber resources of the state are enormous. The chief exports are beef and other food products, quebracho (hard wood), hides and skins

PERU

Cap: Lima; **Area:** 1,281,215 sq. km; **Lang:** Spanish and Quechua; **Rel:** Christian; **Ex. R:** 404.86 Sol=US $ 1.

Peru, on the Pacific coast of S. America, has for its neighbours, Ecuador and Colombia in the north, Brazil and Bolivia in the east and Chile in the south. The Andes mountains dominate Peru. Some of the rarest species of animals, the vicuna, the llama, the alpaca and the cross-breed paco-vicuna are found in the Andean mountains, where they are now protected.

Peru was originally the seat of the famous Inca (Red Indian) Empire. It became independent in 1824.

The leading agricultural products are cotton, wool, sugar, coffee, rice and potatoes. Corn which is native to Peru is the staple food of the Indians, who also cultivate alfalfa. Fishing industry is well developed and Peru is the world's most important producer of fishmeal. The country is rich in minerals and some mines dating back to the Incas are even now worked. Peru is one of the leading producers of silver. Some of the biggest copper mines in the world are located in Peru. The chief exports are cotton, fish products, petroleum, sugar and iron ore.

THE PHILIPPINES

Cap: Manila; **Area:** 300,000 sq. km; **Lang:** Filipino and English; **Rel:** Christian and Muslim; **Ex. R:** 7.8200 Peso=US $ 1.

The Philippines lies 600 miles off the southeast coast of Asia, 15 degrees above the equator. To its north lies Taiwan, to the south Borneo, to the east the Pacific Ocean, and to the west the China Sea.

An archipelago, the Philippines is composed of 7107 islands, which include the main island groups of Luzon, the Visayas, and Mindanao. The country covers a total area of 116,220 square miles.

The country's industries include rubber products, oil-refining, fruit canning, flour milling, paper, salt, cigars and cigarettes, cement, fertilizers, plywood and lumber, metal and glassware, furniture and textiles, medicinal and pharmaceutical goods, food products and beverages.

Major agricultural crops are rice, maize, sugar, tobacco, abaca, pineapple, coconut, bananas, mangoes and others.

The Philippines is rich in natural resources and has iron, silver, gold, chromite, manganese and copper deposits in commercial quantity. It has also marble quarries, forests and extensive fishing grounds in its territorial waters.

Philippines became an independent republic on June 12, 1898.

POLAND

Cap: Warsaw; **Area:** 312,677 sq. km; **Lang:** Polish; **Rel:** Christian; **Ex. R:** 33.20 Zloty=US $ 1.

A People's Republic of Upper Central Europe, Poland is bordered by the Baltic Sea, USSR, Czechoslovakia and the German Democratic Republic.

Poland whose history goes back to the tenth century A.D. became independent in 1918.

Thirty-two per cent of the population is engaged in agriculture. Chief crops are rye, wheat, oats, potatoes, sugar beets, tobacco and flax. The country has vast resources of mineral wealth, particularly coal, besides iron, lignite, natural gas, lead and zinc. Textiles, chemicals and metallurgy are old established industries. New industries include automobiles, tractors, heavy machinery, ship-building and aircraft. Main exports are ships, coal, steel and clothing.

PORTUGAL

Cap: Lisbon; **Area:** 92,072 sq. km; **Lang:** Portuguese; **Rel:** Christian; **Ex. R:** 59.025 Escudo=US $ 1.

Portugal is a small rectangular territory in the southwest corner of the Iberian Peninsula. It is bounded on the north and east by Spain and the south and west by the Atlantic Ocean.

Portugal was an independent kingdom from the 12th century. It became a republic in 1910.

Nineteen per cent of the country is forest, where pine, oak, chestnut and cork grow in abundance. Vineyards are found everywhere and wines, olive oil and fruits are produced in large quantities. The major minerals are coal, copper, kaolin, wolframite, lithium and titanium. Textiles, chemicals, paper and glassware are the principal manufactures. The main exports are wine, canned sardines, tuna, anchovies, resins and cork. Portugal is one of the leading countries in the world which produce cork.

PUERTO RICO

Cap: San Juan; **Area:** 8891 sq. km; **Lang:** Spanish and English; **Rel:** Christian; **C. U:** Dollar.

The island of Puerto Rico lies 50 miles east of Hispaniola (Haiti and Dominican Republics) in the outer Caribbean. It became independent in 1952.

From a purely agricultural country, Puerto Rico is fast changing to an industrial economy. The main crops are sugar, tobacco and coffee. Industries include textiles, clothing, cigars, alcohol, chemicals and household appliances. Tourism is an important source or revenue

QATAR

Cap: Doha; **Area:** 11,000 sq. km; **Lang:** Arabic; **Rel:** Islam; **Ex. R:** 3.6400 Riyal = US $ 1.

Qatar is a 100-mile-long tongue of land jutting into the Persian (Arabian) Gulf. It is surrounded almost on three sides by the Persian Gulf. Saudi Arabia lies to the south.

It became independent in 1971 when Britain withdrew from the Persian Gulf. Qatar is an absolute monarchy.

Most of the population live in and around Doha, the capital. Immigrants from Pakistan, Iran and Oman now outnumber the native Qataris. Today the oil industry provides over 90% of the national income but employs only less than 5% of the population. Qatar is now connected by road to the rest of Arabia and by air to the rest of the world.

ROMANIA

Cap: Bucharest; **Area:** 237,500 sq. km; **Lang:** Romanian, **Rel:** Christian; **Ex. R:** 15.00 Leu = US $ 1.

Romania, lying in the South East of the Central part of Europe, borders on USSR to the north and east, on Hungary to the west, on Yugoslavia to the south west and on Bulgaria to the south.

The Black Sea shore has a length of 245 km. Modern Romania was formed in 1859. Industry now dominates Romania's economy. Romania became an industrial-agrarian country.

Heavy industries predominate: drilling rigs for oil, equipments for oil refineries, petrochemical industry, cement, thermo and hydro electric power, diesel and electric locomotives of high capacity, engineering and consumer goods, etc.

Romanian agriculture recorded profound changes during the last three decades. The changes began with the land reforms of 1945. The small and middle-sized peasant properties were converted into co-operatives, a process which started in 1949 and ended in 1962. Land, which is the common property of the co-operative farmers, is tilled in common.

The exports are mostly made up of machines and equipment, chemical products, chemicals, fertilizers and industrial consumer goods.

RWANDA

Cap: Kigali; **Area:** 26,338 sq. km; **Lang:** French and Kinyarwanda; **Rel:** Tribal and Muslim; **Ex. R:** 92.84 Francs = US $ 1.

Rwanda is a republic in Central Eastern Africa, just below the equator. It is bordered by Zaire, Uganda, Tanzania and Burundi. The population of Rwanda includes Watutsi, Bahutu and Batwa tribes.

The Republic of Rwanda, formerly part of the Belgian Trusteeship of Ruanda-Urundi in east Central Africa, became independent in 1962

The economy is agricultural and remains mainly at the subsistence level. Coffee, cotton and pyrethrum are the principal crops. Minerals include tin ore, tungsten, tantalite, and beryl Industry is undeveloped. Livestock-raising is wide-spread and hides and skins are exported.

SAMOA (WESTERN)

Cap: Apia; **Area:** 2835 sq. km; **Lang:** Samoan and English; **Rel:** Christian; **Ex. R:** 0 93850 Tala = US $ 1.

Western Samoa comprises 4 islands

in the South Pacific Ocean, the largest of them being Savaii and Upolu The International Date Line passes very near to Western Samoa. Eastern Samoa (American Samoa) with its capital at Fagotogo remains a dependency of the USA.

Western Samoa became fully independent on January 1, 1962 and is a member of the Commonwealth.

The economy is mainly agricultural. The chief products are fish, copra, cocoa, bananas, taro, sweet potatoes, bark cloth and mats.

SAN MARINO

Cap: San Marino, **Area**; 61 sq. km; **Lang**: Italian, **Rel**: Christian; **C. U**: Lira.

San Marino is situated on the slope of Mount Titano in the Apennines on the Adriatic side in the heart of Italy.

It claims to be the oldest state in Europe, having been founded in A.D. 301.

The principal products are wheat, wine and olives. Industries include textiles, ceramics, cement, paper, leather and woollen goods. Tourism is the major source of revenue.

SAO TOME & PRINCIPE

Cap: Sao Tome; **Area**: 964 sq. km; **Lang**: Portuguese, native dialects; **Rel**: Christian; **Ex. R**: 37.753 Dobra = US $ 1.

These two islands, with a few other nearby islets, lie in the Gulf of Guinea, about 125 miles from Gabon. Situated north of the equator, these islands have hot steaming weather in the summer, but plenty of rainfall. The largest of the islands is Sao Tome, on which stands *Sao Tome*, the capital and chief port.

These islands were under the Portuguese until 1975 when they became independent.

Today, the country's economy is geared almost exclusively to the production of agricultural export commodities, especially cocoa. Sao Tome has to import most of its food since no food crops are grown. There is virtually no manufacturing industry except soap, soft drinks and such other things

SAUDI ARABIA

Cap: Riyadh (Royal) and Jeddah (Administrative); **Area**: 2,149,690 sq km; **Lang**: Arabic, **Rel**: Islam; **Ex. R**: 3.3550 Riyal = US $ 1

Saudi Arabia occupies nearly four-fifths of the Arabian peninsula with the Yemen Arab Republic and the Red Sea on the west and the Gulf and the UAE on the east. Jordan and Iraq lie in the north and Kuwait in the north east. Oman and the P.D.R. Yemen are in the south.

In the province of Hejaz are Medina, where Mohammed the Prophet was buried on June 7, 632 and Mecca, the birthplace of the Prophet. There is a great mosque in Mecca which shelters the sacred shrine, the Kaaba. On one side of the Kaaba is the black stone believed to have been given to Abraham by Archangel Gabriel. This shrine is the place of pilgrimage for Muslims the world over.

Saudi Arabia is an absolute monarchy, with no parliament.

Saudi Arabia has great oil wealth and is the foremost exporter of petroleum products today. The income from oil forms the major source of public revenue. All the same, Saudi Arabia remains an agricultural country whose main products are dates, wheat, barley, fruit, hides and wool.

SENEGAL

Cap: Dakar, **Area**: 196,192 sq. km, **Lang**: French and native tongues; **Rel**: Muslim and Tribal; **Ex. R**: 262.7 CFA Francs = US $ 1.

Senegal lies on the West African bulge. It is bounded on the north by Mauritania, on the east by Mali and on the south by Guinea and Guinea-Bissau. In the southern part of the country, Gambia forms a narrow enclave extending some 200 miles into the interior.

Formerly a French colony, Senegal became a self-governing republic in 1960.

Agriculture and livestock are the chief occupations. There are important deposits of iron ore and phosphate. Developing industries include food processing chemicals and textiles.

SEYCHELLES

Cap: Victoria, **Area**: 308 sq. km; **Lang**: Creole and French; **Rel**: Christian, **Ex. R**: 6.6500 Rupees = US $ 1.

Seychelles forms a group of lovely islands, in western Indian Ocean. The principal island is Mahe on which the capital Victoria is situated. The group consists of some 92 islands, of which 45 are coralline and the rest granitic.

Seychelles became an independent republic in 1976.

Seychelles was entirely uninhabited when the French established settlements there in 1770.

The population of Seychelles is of mixed origin, a unique blend of European, African, Indian and Chinese races. For a number of years these islands were known as the 'islands of love' and with good reason. Uninhibited sexual relations had existed from the beginning and quite openly. Unwed mothers bore no stigma. Their children suffered no sort of disability, social or legal. The single-parent family had become a vogue. In consonance with their mixed origins, the Seychellois have evolved a mixed language, which may be called Creole. It is an admixture of many languages, European, African, Indian and Chinese. Its basic structure, however, is French.

The main occupation is agriculture. Coconuts take the pride of place among agricultural products. Cinnamon is the next major crop and export. Other crops like tea and lime are also grown. Fishing is another major occupation. Tuna, mullet, mackerel, sardines and shell fish abound in the offshore waters.

SIERRA LEONE

Cap: Freetown; **Area**: 71,740 sq. km; **Lang**: English and Tribal; **Rel**: Tribal; **Ex. R**: 1.1396 Leone=US $ 1.

Sierra Leone (meaning mountain of the lion) was the name originally given to this area by Portuguese sailors mainly on account of the thunder-storms around its coastal peaks. It lies on the West African bulge, between Guinea and Liberia.

Formerly under British rule, Sierra Leone became independent in 1961.

The economy is based on agriculture and mining. Principal products are industrial diamonds, iron ore, bauxite, kola nuts, palm kernels, cocoa and coffee.

SINGAPORE

Cap: Singapore City; **Area**: 616.3 sq. km; **Lang**: Malay and Chinese; **Rel**: Buddhist and Muslim; **Ex. R**: 2.1230 Dollar=US $ 1.

Singapore is a small island with some 54 outlying islets situated at the southern tip of the Malay Peninsula, to which it is linked by a causeway. The island is about 41.84 km in length and 22.53 km in breadth.

The population of Singapore is composite. The Chinese comprise 76.1% and Malays 15.1%.

In August 1965 Singapore became an independent Republic.

The country is an entrepot for Malayasia and other southeast Asian states. The chief exports are rubber and tin. Industries include tin smelting, rubber goods, lumber working and ship-building, textiles and electronics.

SOLOMON ISLANDS

Cap: Honiara; **Area**: 29,758 sq. km; **Lang**: English and Pidgin; **Rel**: Christian; **Ex. R**: 0.8278 Dollar=US $ 1.

The Solomon islands are in the South West Pacific and lie to the east of Papua Guinea. Originally a British Protectorate; it achieved independence in 1978.

The population is predominantly Melenesian. Copra is the main cash crop and rice the chief food crop. Fish is a vital element in food and an export item.

SOMALIA

Cap: Mogadishu; **Area**: 637,657 sq. km; **Lang**: Somali and English; **Rel**: Islam; **Ex. R**: 6.2950 shillings=US $ 1.

A republic on the east coast of Africa, Somali Republic is bounded by the Gulf of Aden on the north, the Indian Ocean on the east, Kenya, Ethiopia and Djibouti on the west.

The Somali Republic was formed by the union of the former Italian Somaliland and the British Somaliland on July 1, 1960.

Somalia is an undeveloped agricultural country. Seventy per cent of the pupulation is nomadic, moving about with their flocks of sheep, goats and camels. Settled agriculture is now being developed along the river valleys.

SOUTH AFRICA

Cap: Cape Town; **Area**: 1,221,037 sq. km; **Lang**: Afrikaans and English; **Rel**: Christian; **Ex. R**: 0.81927 Rand=US $ 1.

The Republic of South Africa lies at the southern tip of the continent of Africa. Namibia and Botswana lie in the north and Mozambique in the NE, and Swaziland in the east. S. Africa includes the original white colonies of the Cape of Good Hope, Natal, Transvaal and

Orange Free State. Formerly known as the Union of South Africa, it became a republic after leaving the Commonwealth in March 1960.

The major agricultural products are cotton, wheat, tobacco, sugarcane and citrus fruits. With vast mineral resources, South Africa is the biggest gold and diamond producing country in the world and one of the biggest in uranium. About 47 per cent of the world's total production of gold is from South Africa. Other minerals include coal, copper, tin, manganese, iron, lead and chrome. Manufacturing industries include heavy engineering, chemicals, textiles and food processing.

The country follows a policy of *Aparthied*, the separate development of racial groups.

Dummy States. By 1982 South Africa had delivered 4 dummy states—Transkei, Bophuthatswana, Venda and Ciskei. A fifth Kwandebele was on the way in 1982.

These settlements of the black population are declared to be independent states. Once the blacks are herded into these states, they lose their South African citizenship —whatever it was worth. They become citizens of the new states—whatever it may mean.

No country in the world has recognised these states as independent entities. Nevertheless,the show goes on.

SPAIN

Cap: Madrid; **Area**: 504.750 sq. km; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 89.259 Peseta=US $ 1.

Spain is bounded on the north by France and the Bay of Biscay and on the west by Portugal. To the east is the Mediterranean.

With the discovery of America for Spain by Columbus in 1492, Spain became a great colonial empire. After the defeat of the Spanish Armada by England in 1588, Spain shrunk into a minor continental power. In 1939, it passed under the dictatorship of Gen. Franco. On Franco's death in 1975 Spain became a constitutional monarchy.

Traditionally an agricultural country Spain's main products are cereals, vegetables and fruits. Industries include chemicals, machine tools and shipbuilding.

SRI LANKA

Cap: Colombo; **Area**: 65.610 sq. km; **Lang**: Sinhala and Tamil; **Rel**: Buddhist and Hindu; **Ex. R**: 18.350 Rupees=US $ 1.

Ceylon, now officially called Sri Lanka, is an island, separated from India by the shallow Palk Strait. It is bounded on the west by the Palk Strait and the Gulf of Mannar, on the north and east by the Bay of Bengal and on the south by the Indian Ocean.

Sri Lanka became independent in 1948 as a member of the Commonwealth.

Sri Lanka's major products are agricultural—tea, rubber and coconuts. The commercially important mineral is graphite. There are deposits of iron ore, monazite, ilmenite, limestone, clay and kaolin. Industries include cement, textiles and fertilizers. Sri Lanka has in recent years embarked on a programme of economic reconstruction in which the harnessing of the Mahawali river for irrigation and hydel power, a housing construction programme, an Investment Promotion Zone etc., are important features.

ST. KITTS-NEVIS

Cap: Basseterre; **Area**: 269 sq. km; **Lang**: English and Patois; **Rel**: Christian; **C. U**: Dollar.

Saint Kitts-Nevis is two islands in east Caribbean separated by a narrow channel 2 miles wide. The islands were given the status of an Associate State with Britain in 1967. At that time Anguilla was part of St. Kitts-Nevis. The Anguillans revolted against this arrangement and Anguilla was separated. (see *Dependencies* infra).

The population is mostly black. The economy is agricultural, sea island cotton and sugar cane being the principal crops.

ST. LUCIA

Cap: Castries; **Area**: 616 sq. km; **Lang**: English and French patois; **Rel**: Christian; **C. U**: Dollar.

St. Lucia, the second largest island in the Windward group, lies to the south of Martinique and to the north of St. Vincent. It became independent on Feb. 22, 1979.

The economy is agricultural, copra, coconut oil, bananas and cocoa being the main export items. Manufactures include plastics, garments and beer

ST. VINCENT

Cap: Kingstown; **Area**: 389 sq. km; **Lang**: English and French patois; **Rel**: Christian; **C. U**: Dollar.

One of the Windward Islands, west of Barbados, St. Vincent becme a British Associate State in 1969 and achieved independence on Oct. 27, 1979.

The population is of mixed origin—European-Negro and Carib-Indian. Bananas, arrowroot, copra, sea island cotton and spices are the main exports. Tourism is important.

SUDAN

Cap: Khartoum; **Area**: 2,505,813 sq. km; **Lang**: Arabic and English; **Rel**: Muslim, Christian and Tribal; **Ex. R**: 0.50000 Pound=US $ 1.

A republic of north east Africa, Sudan is bounded by Egypt on the north, the Red Sea and Ethiopia on the east, Kenya in the south east and Uganda and Zaire on the south. Central African Republic and Chad lie to the west. The White Nile flows through the middle of the country and joins the Blue Nile at Khartoum. The Sudanese population consists of Arabs, Negroes and Nubians of mixed Arab and Negro blood. Sudan became an independent state in 1885.

The main agricultural crop sorghum is the country's staple food. Other products include longstaple cotton, sesame, peanuts, dates, hides and skins, chillies, beans and corn. Sudan is the world's principal source of gum Arabic. Rice, peanuts, coffee, sugarcane and tobacco are expanding items of agricultural production. Sudan's mineral wealth includes copper, gold, iron, manganese and magnesite.

Oil was struck recently in the Sudan. The country expects to be self-sufficient in oil by 1983, and an exporter from 1984.

SURINAME

Cap: Paramaribo; **Area**: 163,265 sq. km; **Lang**: Dutch and English; **Rel**: Muslim and Christian; **Ex. R**: 1.7850 Guilder=US $ 1.

Suriname, formerly Dutch Guiana, lies on the north east coast of South America. It shares its frontiers with French Guiana in the east, Brazil in the south and the Republic of Guyana in the west. The Atlantic Ocean (Caribbean Sea) bounds it on the north. it became independent in 1975.

The population comprises a medley of ethnic strains—Negroes, Chinese, East Indians and Indonesians. Mulattoes (of mixed European and East Indian parentage), Amerindians and Europeans form 40 per cent of the population.

Much of the land is given to rice cultivation. The country is rich in minerals. It is the second biggest producer of bauxite in the world. Bauxite, alumina and aluminium constitute nearly 90 per cent of the exports.

SWAZILAND

Cap: Mbabane; **Area**: 17,363 sq. km; **Lang**: English and si-Swati; **Rel**: Christian and Tribal; **Ex. R**: 0.81927 Lilangeni=US $ 1.

Swaziland is surrounded almost entirely by South Africa. Mozambique to the east is its only other neighbour.

Swaziland, formerly a British protectorate, attained independence on Sept. 6, 1968.

Sugar is the principal item in the economy, with citrus fruits, cotton, rice and maize, coming next. But the main wealth of the Swazis is cattle. There are considerable mineral reserves, especially, asbestos, iron and coal.

SWEDEN

Cap: Stockholm; **Area**: 449,793 sq. km; **Lang**: Swedish; **Rel**: Christian; **Ex. R**: 4.763 Krona=US $ 1.

Sweden is the largest of the Nordic countries and in terms of area, the fourth largest country in Europe. To the west, the Scandinavian mountain range divides Sweden from Norway. To the northeast, a shorter range separates Sweden from Finland. Otherwise, Sweden is surrounded by water—the Baltic Sea and the North Sea. Sweden has been a constitutional monarchy since 1434.

Sweden has rich natural supplies of coniferous forest, water power, iron ore, uranium and other minerals but lacks significant oil and coal deposits.

The country is highly industrialised. To-day about 40 per cent of the country's industrial production is exported. Swedish steel is especially reputed for tool making. Sweden is one of the greatest producers of wood pulp, paper and lumber

SWITZERLAND

Cap: Berne; **Area**: 41,293 sq. km; **Lang**: German, French, Italian and Romansch; **Rel**: Christian; **Ex. R**: 2.1 Francs=US $ 1.

Switzerland, a Confederation in Central Europe, is bounded by France, Germany, Austria and Italy. It is a mountainous country, with the Alpine ranges rising from its bosom. The country is famous for its lakes.

Since 1291 Switzerland has remained a completely independent country. It is a multi-lingual state with most people talking more than one language.

The Swiss terrain offers little scope for farming. Nevertheless, a number of small efficient farms operate and keep the farming community going. The emphasis is on livestock and dairying. Forests help by providing plenty of wood. From the earliest times Switzerland had been famous for its cottage industries—high quality products but no large-scale production. Swiss-made watches and clocks are famous the world over. Precision tools and machines form another specialised industry. The availability of electric power in every cottage has fostered growth of all kinds of small industries throughout Switzerland. Tourism is the third most paying industry. India has always been one of the major recipients of Swiss assistance, specially in the areas of cattle breeding, rural development, vocational training and in various fields of applied research.

SYRIA

Cap: Damascus; **Area**: 185,180 sq. km; **Lang**: Arabic; **Rel**: Islam; **Ex. R**: 3.925 pounds=US $ 1.

The Syrian Arab Republic in the Middle East lies in between Turkey, Iraq, Jordan, Israel and Lebanon. The Mediterranean Sea is on the west. The Orontes and Euphrates rivers pass through Syria. The chief seaport is Latakia.

Syria, the seat of an ancient civilization, became a fully independent sovereign republic in 1944.

Agriculture and cattle-breeding comprise the major occupations of the people. The chief crops are cotton, wheat, tobacco and olives. The only mineral found is oil. Industries include oils, soap, textiles, leather and tobacco

TAIWAN

Cap: Taipei; **Area**: 35,981 sq. km; **Lang**: Mandarin Chinese, **Rel**: Buddhist and Confucian; **C. U**: Dollar.

Taiwan, formerly known as Formosa includes not only Taiwan proper, but also a number of small islands.

Originally Taiwan and adjoining areas were Chinese territory. In 1950 Chiang Kai-Shek made Taiwan the headquarters of the Nationalist Republic of China Although Taiwan still claims to be the legal government of all China it lost its membership in the UN and its permanent seat in the Security Council to Communist China in 1971

The main agricultural products are rice, tea, sugar, sweet potatoes, ramie, jute and turmeric. Camphor secured from forests is a governmental monopoly. Industries comprise cotton fabrics and electrical goods, iron works, glass and soap. Coal, marble, petroleum and natural gas are the principal minerals.

TANZANIA

Cap: Dar-es-Salam; **Area**: 945,087 sq. km; **Lang**: Kiswahili and English; **Rel**: Christian and Muslim; **Ex. R**: 8.2294 Shillings=US $ 1

Tanzania consists of Tanganyika and the islands of Zanzibar and Pemba. Tanganyika is situated in East Africa and lies in between Uganda, Kenya, Mozambique; Malawi and Zambia. Zaire is on the west and the Indian Ocean is on the east. The islands of Zanzibar, Pemba, Lamu, Menda, Patta and Siu are about 40 km off the coast north of Dar-es-Salam.

In April 1964, the People's Republic of Zanzibar and Pemba and the Republic of Tanganyika merged to form the United Republic of Tanzania.

The economy is agricultural The chief cash crops are sisal, sugar, cotton and coffee. Cloves are grown on the islands, chiefly on Pemba. Livestock is extensively raised. Diamonds are an important export. Other minerals include gold, tin and salt.

THAILAND

Cap: Bangkok; **Area**: 542,373 sq. km; **Lang**: Thai; **Rel**: Buddhism and Islam; **Ex. R**: 20.780 Baht=US $ 1.

Thailand, formerly known as Siam, is a constitutional monarchy in southeast Asia and has for its neighbours, Burma, Laos and Kampuchea. The Gulf of Siam lies to the south.

Thailand, an ancient autocracy, became a constitutional monarchy in 1932. In 1948 the country assumed its present name Thailand.

Agriculture is the mainstay of the country and engages 60 per cent of the population. The chief crop is rice, much of which is exported. Coconuts, tobacco, cotton and teak are other items of agricultural exports. During the last decade Thailand increased her export of manufactured and processed items. Minerals include tin, manganese, tungsten, antimony, lignite and lead.

TOGO

Cap: Lome; **Area:** 56,600 sq. km; **Lang:** French (official) and Tribal; **Rel:** Tribal and Christian; **Ex. R:** 262.7 CFA Francs=US $ 1.

The Republic of Togo, formerly Togoland, lies on the west coast of Africa forming a narrow strip stretching from the Gulf of Guinea north to Upper Volta, with Ghana to the west and Benin to the east. Togo became independent in 1960.

The principal products are coffee, cocoa, cotton, palm kernels, kapok and groundnuts. Togo's considerable natural resources are still largely undeveloped but phosphates are being mined in increasing quantities, and now form the country's principal export.

TONGA

Cap: Nuku'alofa; **Area:** 748 sq. km; **Lang:** English and Tongan; **Rel:** Christian; **C. U:** Pa anga.

Tonga consists of 169 islands and islets in the south western Pacific Ocean. The Tropic of Capricorn and the International Date Line cross each other very near Tonga.

Tonga became a British-protected state in 1900 and independent state on June 4, 1970

Tonga is an agricultural country Vegetables and fruits are grown for local consumption. The most important export crop is copra; next come bananas.

TRINIDAD AND TOBAGO

Cap: Port-of-Spain; **Area:** 5128 sq. km; **Lang:** English; **Rel:** Christian; **Ex. R:** 3.00 Dollars=US $ 1.

Trinidad, the second largest and most southerly of the West Indian Islands (south of Windward isles), lies very near the north coast of South America. Attached to it for administrative purposes is the island of Tobago. Tobago is often called Robinson Crusoe Island in the belief that this was the island on which Crusoe was stranded. It is just 20 miles from Trinidad. Tobago is famous for its rich avian fauna.

Formerly a British Colony, Trinidad & Tobago achieved independence in 1962 and assumed republican status in 1976.

Industries include oil processing, manufactured goods and tourism. Chief crops are sugar, citrus fruit and cocoa.

TUNISIA

Cap: Tunis; **Area:** 163,610 sq. km; **Lang:** Arabic (official) and French; **Rel:** Islam; **Ex. R:** 0.4908 Dinar=US $ 1.

A republic of North Africa, lying on the Mediterranean coast, Tunisia is bounded by Algeria on the west and Libya on the east.

Formerly a French protectorate, Tunisia became autonomous in 1955, and assumed republican status in 1957.

Tunisia is an agricultural country, and produces wheat, barley, oats, dates, olives, apricots, almonds, figs, peaches, vegetables and alfa grass. The chief minerals are phosphates, iron, lead and zinc. The principal exports are olive oil, wine, phosphates and grains.

TURKEY

Cap: Ankara; **Area:** 779,452 sq. km; **Lang:** Turkish and Arabic; **Rel:** Islam; **Ex. R:** 99 Lira=US $ 1.

A republic of southeastern Europe and Asia Minor, Turkey is bounded by the Aegean Sea, the Black Sea, the USSR, Iran, Iraq, Syria, the Mediterranean Sea, Greece and Bulgaria. Turkey occupies a strategic position, linking as it does Asia and Europe at the Straits of Bosporus, between the Mediterranean and the Black Sea. The major portion of Turkey lies in Asia Minor.

Asiatic Turkey, that is, Anatolia, was the seat of one of the earliest civilizations known. Istanbul, the present capital, was first known as Byzantium and then as Constantinople The Ottoman Turks conquered Constantinople in 1453 and founded a

Turkish Empire. In 1923 Turkey became a republic.

Agriculture maintains about 64 per cent of the population. The chief products are tobacco, wheat, cotton, olive oil and sugar. Turkey is the world's second largest producer of sultana raisins. Sheep and cattle abound in the plateau of Anatolia and provide mohair for which Turkey is famous. The main minerals are iron ore, copper, chromium, bauxite and coal.

TUVALU

Cap: Funafuti; **Area**: 26 sq. km; **Lang**: Tuvaluan, English; **Rel**: Christian; **C. U**: Dollar

Formerly known as the Ellice Islands, Tuvalu is a scattered group of nine small atolls in the Western Pacific Ocean, north of Fiji and east of Solomon islands. It became independent in 1975 under the name Tuvalu.

The poor quality of the soil permits subsistence farming of coconuts only. Copra and postage stamps are the main foreign exchange earners.

UGANDA

Cap: Kampala; **Area**: 241,139 sq. km; **Lang**: English and Luganda; **Rel**: Tribal and Muslim; **Ex. R**: 7.7236 Shillings=US $ 1.

Uganda, an equatorial state in East Africa, is bounded by the Sudan on the north, Zaire in the west, Rwanda and Tanzania on the south and Kenya on the east.

Formerly a British protectorate, Uganda became independent in 1962 and a republic in 1963

The economy is agricultural. Main products are cotton and coffee. Tea, sugar, vegetable oils, oil seeds, hides skins and tobacco are exported. Copper is the chief mineral.

UNION OF SOVIET SOCIALIST REPUBLICS (USSR)

Cap: Moscow; **Area**: 22,400,000 sq. km; **Lang**: see below; **Rel**: (see below); **Ex. R**: 0.71 Ruble=US $ 1.

USSR, the largest country in the world in point of area, stretches across the continents of Asia and Europe. The country extends for over 6000 miles from the Baltic Sea to the Pacific Ocean and for 3000 miles from north to south. In the west it reaches the Gulf of Finland in Europe and in the east the North Pacific Ocean in Asia. In the far north east, the Bering Strait separates it from Alaska.

The Soviet Union includes within its boundaries 15 Union Republics, 20 Autonomous Republics and 8 Autonomous Regions. A brief description on each Union Republic is given below.

Russian SFSR[*]. The Russian Federation ranks first among all the Union Republics in size, population and economic potential. The RSFSR ranks among the ten biggest industrial countries in the world.

Ukrainian SSR[†] is the most densely populated area among the Republics. It is the chief wheat producing area of the Soviet Union.

Byelorussian SSR is situated on the western border of Soviet Union. Principal crops are flax, grain and potatoes. Industries include agricultural machinery, machine tools, woollen textiles etc.

Azerbaijan SSR is the chief oil-producing area of the Soviet Union.

Georgian SSR contains the largest manganese mines in the world. It produces steel, automobiles, locomotives, computers etc.

Armenian SSR cultivates cotton and tobacco. Copper and lead are mined. The population is 88 per cent Armenian.

Uzbek SSR contains the finest cotton lands in the Union. A high quality *caracul fur* is produced for export.

Turkmen SSR in Central Asia produces cotton, grain and oil seeds. The Kara Kum desert occupies four-fifths of the territory.

Tadzhik SSR (Tadzhikistan) comprising former regions of Bokhara and Turkestan is an agricultural area.

Kazakh SSR has vast deposits of coal, oil, iron, tin and copper. Its extensive pasture lands were converted into grain-growing lands in 1953-54.

Kirghiz SSR, on the border of Sinkiang (China), is purely an agricultural area.

Moldavian SSR, is an agricultural region.

Lithuanian SSR on the Baltic is also an agricultural area where cattle and hogs are bred.

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[*] Russian Federation of Soviet Republics.

[†] SSR. Soviet Socialist Republic.

Box 32
A Modern Babel

MOSCOW, July 11,

Between the Ukrainian language, spoken by 40 million people, and the Eskimo language, mother-tongue of just 1,300 people, there are 161 non-Russian languages spoken in the Soviet Union.

Contrary to western allegations, no language group, however small, has been "assimilated" by Russian, the largest language group, reports APN. For all such groups, Russian is only a "second" language, one which facilitates communication between the numerous nationalities.

The Hindu July 12, 1982

Latvian SSR on the Gulf of Riga in the Baltic Sea has extensive timber and peat resources.

Estonian SSR, situated on the Baltic Sea between the Gulf of Riga and Finland, manufactures textiles and railway materials and is a shipbuilding centre.

Union Republics of USSR

Republic	*Area sq. km.*	*Population (Est. 1978)*
Russian SFSR	17075000	137552000
Ukrainian SSR	603700	49757000
Kazakh SSR	2717300	14700000
Uzbek SSR	447400	15400000
Byelorussian SSR	207600	9600000
Azerbaijan SSR	86600	6000000
Georgian SSR	69700	5000000
Moldavian SSR	33700	3900000
Lithuanian SSR	65200	3400000
Kirghiz SSR	198500	3500000
Tadzhik SSR	143100	3800000
Armenian SSR	29800	3000000
Latvian SSR	63700	2500000
Turkmen SSR	488100	2800000
Estonian SSR	45100	1500000

Constitution and Government

The Communist party with 17.5 million members (1977) plays a leading role in government and is the substantial policymaking body. The supreme organ of the Party is the Congress which lays down policy and elects the Central Committee. The Central Committee forms the Politbureau and the Secretariat.

Economy: USSR has a planned economy. Planning is based on public ownership in industry and trade and on state and collective or co-operative ownership in agriculture.

Languages: Russian is the dominant language of the Union. Other national languages which number about 130 are also spoken and written.

Religions: All religions, including no religion' are permitted in the USSR. Separate figures showing the adherents of various faiths are not available.

The new Constitution adopted by the Supreme Soviet of the USSR on the 7th Oct. 1977 spells out "statutory obligations on deputies, enterprises and officials for fulfilment of the electors' mandates."

THE UNITED ARAB EMIRATES

Cap: Abu Dhabi; **Area:** 82,880 sq. km; **Lang:** Arabic; **Rel:** Islam; **Ex. R:** 3.6750 Dirham = US $ 1.

The United Arab Emirates consist of seven Sheikdoms in the Persian Gulf—Abu Dhabi, Dubai, Sharjah, Umm al Quwain, Ajman, Fujairah and Ras al Khaimah. The first six Sheikdoms signed the Union agreement on 2nd Dec. 1971. Ras al Khaimah joined the Union only in February 1972.

Abu Dhabi, which is the capital of the Union, is the largest of the Emirates in area. Dubai is the main port of the Union and now has the largest harbour in the Middle East. The economy of UAE is almost entirely dependent on oil.

UNITED KINGDOM

Cap: London; Area: 244,108 sq. km; **Lang:** English; **Rel:** Christian; **Ex. R:** 0.46720 Pound = US $ 1

A constitutional monarchy, the United Kingdom comprises the Island of Great Britain and Northern Ireland, together with many small islands. It is separated from the coast of Western Europe by the English Channel to the south and by the North Sea to the east. The northern and western shores are washed by the Atlantic Ocean

Great Britain. It is the largest of the islands forming the United Kingdom. It comprises England, Scotland, Wales, the Isle of Man and the Channel Islands St. George's Channel and Irish Sea lie between the UK and Ireland. Britain is much less than half the size of France or Germany and would fit forty times into the United States of America. Yet, for hundreds of years this island has been a world power. From its shores men set out to lay the foundation of what is now the United States of America, to develop Canada, Australia, New Zealand, the Indian continent and great areas of Africa. British institutions and methods of government have set the pattern for lovers of freedom everywhere. And today Britain's Queen is Head of a family of several million people, spread all over the world.

Great Britain is a constitutional monarchy. The sovereign is the Head of State and monarchy is hereditary. Actual power is vested in Parliament which is the supreme legislative body in Great Britain. The Parliament consists of two houses—the House of Lords and the House of Commons.

Britain is one of the world's leading industrial and exporting countries. Chief industries are iron and steel, engineering, chemicals, electronics, motor vehicles, aircraft, textiles, cloth and other consumer goods. Its coal mines yield about 128 million tons annually. Although Britain's agriculture and trawler-fishing are highly mechanised, half of the country's food supplies and most of its raw materials are imported.

Northern Ireland. Northern Ireland is situated in the northeast of Ireland and forms part of the United Kingdom. It comprises six Ulster counties of Antrim, Armagh, Down, Fermanagh, Londonderry and Tyrone. The rest of the island forms the Republic of Ireland.

Agriculture is the main occupation in Northern Ireland. Cattle, sheep, hogs, eggs, poultry, potatoes and milk are the important products. Linen, ropes, twines, rayon, clothing, tobacco, aircraft and shipping form the main branches of industry.

UNITED STATES OF AMERICA

Cap: Washigton D.C.; **Area:** 9,399,317 sq. km; **Lang:** English; **Rel:** Christian; **C.U:** Dollar.

The United States of America is a federal republic composed of 50 states, of which all except one—Hawaii islands—are in mainland America.

The United States of America, which covers the central part of North America, grew out of the British Colonies that were established in North America in the first half of the 17th century.

USA's participation in the First World War and the victory of the Allies made it a world power. The end of the Second World War saw the emergence of USA as one of the super-powers of the world.

The Union originally comprised 13 states, to which 7 were added subsequently. Thirty other states, which were formerly territories were also admitted into the Union as full states, thus making up 50 states in all, apart from the District of Columbia. Each state has its own constitution. The state constitutions provide for a legislature of two Houses, (except Nebraska which has only one House), a Governor and a judicial system of its own. The state governments can deal with all matters which are not reserved to the federal legislature. The following table gives the existing States of the Union with their area, population and capitals

Table 65

States of the Union

Name	*Area (Sq. km)*	*Population (1980)*	*Capital*
Alabama (AL)[*]	133000	3890061	Montgomery
Alaska (AK)	1524640	400481	Juneau
Arizona (AZ)	295000	2717866	Phoenix
Arkansas (AR)	135000	2285513	Little Rock
California (CA)	410000	23668562	Sacramento
Colorado (CO)	296000	2888834	Denver
Connecticut (CT)	13000	3107576	Hartford
Delaware (DE)	6900	595225	Dover
District of Columbia (DC)	179	637651	Washington D.C.
Florida (FL)	152200	9739992	Tallahassee
Georgia (GA)	152487	5464265	Atlanta
Hawaii (HI)	16702	965000	Honolulu
Idaho (ID)	215000	943935	Boise
Illinois (IL)	146075	11418461	Springfield
Indiana (IN)	93993	5490179	Indianapolis
Iowa (IA)	145790	2913387	Des-Moines
Kansas (KS)	213063	2363208	Topeka
Kentucky (KY)	104622	3661433	Frankfort

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[*] Postal two-letter (both capitals) abbreviations for U.S. states were introduced with the ZIP Code in 1963. These are fast replacing the older abbreviations

Louisiana (LA)	125665	4203972	Baton Rouge
Maine (ME)	86000	1124660	Augusta
Maryland (MD)	27394	4216446	Annapolis
Massachusetts (MA)	21000	5737037	Boston
Michigan (MI)	151000	9258344	Lansing
Minnesota (MN)	218576	4077148	St. Paul
Mississippi (MS)	123000	2520638	Jackson
Missouri (MO)	180000	4917444	Jefferson City
Montana (MT)	380000	786690	Helena
Nebraska (NE)	200000	1570006	Lincoln
Nevada (NV)	285000	799184	Carson City
New Hampshire (NH)	24905	920610	Concord
New Jersey (NJ)	21285	7364158	Trenton
New Mexico (NM)	314000	1299968	Santa Fe
New York (NY)	128490	17557288	Albany
North Carolina (NC)	135000	5874429	Raleigh
North Dakota (ND)	183000	652695	Bismarck
Ohio (OH)	107177	10797419	Columbus
Oklahoma (OK)	181440	3025266	Oklahoma City
Oregon (OR)	251000	2632663	Salem
Pennsylvania (PA)	117400	11866728	Harrisburg
Rhode Island (RI)	3156	947154	Providence
South Carolina (SC)	80736	3119208	Columbia
South Dakota (SD)	199550	690178	Pierre
Tennessee (TN)	109400	4590750	Nashville
Texas (TX)	680000	14228383	Austin
Utah (UT)	220000	1461037	Salt Lake City
Vermont (VT)	24983	511456	Montpelier
Virginia (VA)	106119	5346279	Richmond
Washington (WA)	176000	4130163	Olympia
West Virginia (WV)	62870	1949644	Charleston
Wisconsin (WI)	146000	4705335	Madison
Wyoming (WY)	251228	470816	Cheyenne

States of the Union - Economic Resources

Alabama is the leading heavy industry state of the south; major industries are iron, textiles and steel. **Alaska** is the largest state. Resources include minerals, timber, petroleum and fish. **Arizona** is a mining and manufacturing state. The main minerals are copper, gold, vanadium, uranium and silver. Tourism and agriculture are also important. **Arkansas** produces 96% of US bauxite (aluminium ore) and has the only active diamond mine of USA. **California** is the most populous state of the Union. Main industries are farming, fishing and manufacturing. Other resources include oil and timber. **Colorado** is one of the largest producers of molybdenum, uranium and vanadium. Farming and production of petroleum are major activities. **Connecticut** is reputed for its high quality tobacco and a variety of manufactured goods. **Delaware** produces corn, soybeans, potatoes and chickens. Other products are chemicals, leather, machinery and textiles. **District of Columbia** is the capital of the US and its main activities centre around that function. It has some light industries and services. **Florida's** economy rests on tourism manufacturing and agriculture. It is a leading producer of citrus fruits. **Georgia** is the leading paper manufacturer of USA and supplies half the world's resin and turpentine needs. **Hawaii** is famous as a tourist centre and is reputed for its cane sugar and pineapple. **Idaho** is the leading silver producer of the Union. Mining, lumbering and farming are other important activities. **Illinois** is a rich state with important manufacturing, mining, farming and oil industries. **Indiana** is a manufacturing state which also produces substantial quantities of soybeans, corn, tobacco, wheat oats and rye. **Iowa**, famous for its corn and livestock, produces today manufactured articles worth three times the value of its farm products. **Kansas**, a leading wheat growing state, has large flour milling and meat packing industries. **Kentucky** is famous for its thoroughbreds (horses) and Kentucky Derby as well as for its tobacco and whisky. **Louisiana** is mainly an agricultural state with high yields of sugarcane, sweet potatoes, rice and cotton. **Maine** is one of the world's largest pulp-paper producers and raises large quantities of potatoes and poultry

Maryland is an important supplier of sea foods, vegetables and other farm products. **Massachusetts** is reputed for its electronic industries and dairy products. **Michigan** is the headquarters of the auto industry and produces a variety of other products. **Minnesota** produces around 60% of the country's iron ore and is a centre of vegetable canning. **Mississippi** is the leading producer of cotton in the country. Other crops include corn, oats, rice and peanuts. **Missouri** is important as a producer of transportation equipment, shoes, lead and beer. **Montana** is a mining state and produces copper, zinc, lead, silver, coal, oil and livestock. **Nebraska** leads in the cultivation of rye, corn and wheat and in cattle and hog industries. **Nevada** is a leading producer of copper. Other minerals are gold, silver, lead, zinc, mercury and tungsten.

New Hampshire is primarily agricultural and produces fruits, corn, potatoes and hay. **New Jersey** specialises in chemicals and is a centre of scientific research. **New Mexico** is a leading producer of cattle and grain. Mining is another important industry. **New York**, the nerve centre of the country, leads in foreign trade, commerce, manufacturing and theatre arts. **North Carolina** is the country's largest furniture, tobacco, brick and textile producer. **North Dakota** is one of the country's largest agricultural producer. Products include wheat, barley, oats, rye and livestock. **Ohio** is preeminently industrial, with large coal and oil resources. It has a near monopoly of autotyre production.

Oklahoma combines agricultural and industrial production. Main industries are electronics, oil, and meat packing. Wheat, corn and cattle are the chief farm products. **Oregon** has the largest timber reserves of the country and a flourishing wood processing industry. The state also owns one of the world's largest salmon fishing industries. **Pennsylvania**. The main industry is steel, supported by a wide variety of manufacturing industries. The state owns the major reserves of hard coal and cobalt in the country. **Rhode Island**. The chief industries are silverware, jewellery and machine manufactures. **South Carolina**. The largest industry is textiles. Farm products include livestock, cotton, tobacco, peaches, corn and oats. **South Dakota** is the country's largest gold producer though agriculture predominates. Main farm products are wheat, corn, oats, barley, rye and livestock. **Tennessee** is mainly industrial. Products include chemicals, aluminium, food, textiles, shoes, wood and metal products. **Texas** leads the country in the production of oil, natural gas, cotton, cattle, sheep, wool and turkeys. **Utah** has rich resources of copper, gold, silver, lead and zinc. Oil production is also important. **Vermont** leads in marble and maple syrup production, and has large reserves of granite and asbestos. **Virginia**. The major resources are coal, timber, oyster beds and fisheries. **Washington** is a leading producer of wheat and apple and has vast forests of fir, hemlock, spruce, larch, cedar and pine. **West Virginia** leads in bituminous coal production. Other products are steel, glass, aluminium chemicals and cattle. **Wisconsin** is the leading producer of milk and cheese in the country. Other products include cars, furniture, paper and beer. **Wyoming** produces wool, cattle, oil, uranium and coal. It has also a large tourist industry.

UPPER VOLTA

Cap: Ouagadougou; **Area**: 274,200 sq. km; **Lang**: French and native languages; **Rel**: Tribal and Muslim; **Ex. R**: 262.7 CFA Francs = US $ 1

The Republic of Upper Volta is a landlocked state in West Africa surrounded by Mali, Niger, Benin, Togo, Ghana and Ivory Coast.

Formerly a province of French West Africa, Upper Volta achieved full independence in 1960.

It is almost exclusively an agricultural country with 80 per cent of the population dependent on agriculture. Livestock raising is highly developed. Principal crops are sorghum, millet, yams, cotton, rice, peanuts and karite. Industry is limited to local handicrafts.

URUGUAY

Cap: Montevideo; **Area**: 176,215 sq. km; **Lang**: Spanish; **Rel**: Christian; **Ex. R**: 10 Peso = US $ 1.

Uruguay is the smallest republic in South America. It lies on the north bank of the estuary of the River Plate with Brazil to the north and Argentina to the west.

Uruguay, once a part of the Spanish Empire and later a province of Brazil, became independent in 1825.

Livestock raising is Uruguay's principal occupation and takes up 60 per cent of its total land area. The chief products are meat, wool, hides, corn, wheat, citrus fruit, rice, tobacoo, oats and linseed. Important industries are vinery, meatpacking and textiles.

VANUATU

Cap: Vila; **Area**: 14,760 sq. km; **Lang**: English, Pidgin; **Rel**: Christian; **C. U**: Franc.

New Hebrides became independent under the name Vanuatu on July 1, 1980. It is a double chain of 13 large and 80 small islands in the Pacific. The largest island is the Espiritu Santo. Originally a haunt of European pirates, they came under the control of France and Britain in 1906.

The population is overwhelmingly Melanesian. The major cash crops are copra, coffee and cocoa. Piggery is well developed. Manganese has been mined since 1961 and exported to Japan.

THE VATICAN CITY

Cap: Vatican City; **Area**: 0.4 sq. km; **Lang**: Italian and Latin; **Rel**: Christian.

Vatican City, the City of the Pope, is an independent sovereign state and includes St. Peter's Cathedral, Vatican Palace and Museum, the Vatican Gardens and neighbouring buildings. Vatican has its own railway station, postal system and police.

VENEZUELA

Cap: Caracas; **Area**: 912,050 sq. km; **Lang**: Spanish, **Rel**: Christian; **Ex. R**: 4.292 Bolivar=US $ 1.

Venezuela (sixth largest country in South America) is the northernmost state of South America and is surrounded by Guyana, Brazil and Colombia. The Caribbean Sea bounds it on the north. Formerly a Spanish colony, Venezuela (Little Venice) became independent in 1821.

Venezuela is rich in minerals. It is one of the world's leading producers of oil and is a member of the OPEC. Oil prosperity is evident everywhere. Venezuela is rich in diamonds and ranks 8th in world production. Other minerals are iron & steel, aluminium, copper, tin and manganese. Agricultural products include coffee, cocoa, black beans, bananas, maize, rice and sugar.

VIETNAM

Cap: Hanoi; **Area**: 329,566 sq. km; **Lang**: Vietnamese; **Rel**: Buddhist; **C. U**: Dong.

The Socialist Republic of Vietnam (now comprising former North and South Vietnam) is bordered by China, Laos, Kampuchea and South China Sea.

Vietnam is a mountainous country. Running almost its entire length, is a mountain chain—the Annamite Chain. On one side of the mountain chain is the fertile Red River delta in the north and on the other side is the Mekong delta in the south. The two deltas form the rice bowl of the country.

The country is primarily agricultural. Rice is the dominant crop and an export item. Other crops are rubber, sugarcane, coffee & tea. Minerals include coal, tin, copper, chromium and phosphates in the north. Industries like cement, metallurgy, chemicals, paper and textiles are found in the south.

YEMEN (NORTH)

Cap: Sana'a; **Area**: 200,000 sq. km; **Lang**: Arabic; **Rel**: Islam; **Ex. R**: 4.5625 Rial=US $ 1.

The Yemen Arab Republic is in the south west of the Arabian peninsula. It is bounded by South Yemen on the south and east, Saudi Arabia on the north and east and the Red Sea on the west. The Yemen Arab Republic was established on Sep. 27, 1962.

The main agricultural products are coffee, dates, herbs, fruits, millet and maize. Cotton, coffee, hides and skins are exported.

YEMEN (SOUTH)

Cap: As Shaab (Aden); **Area**: 463,576 sq. km; **Lang**: Arabic; **Rel**: Islam; **Ex. R**: 0.34540 Dinar=US $ 1.

The People's Republic of Yemen, South Yemen for short, comprises a strategic port (Aden) and a large area of mainly desert territory on the southern shore of the Arabian peninsula. Its neighbours are North Yemen to the north-west, Saudi Arabia to the north, and Oman to the east. The Gulf of Aden lies to the south.

South Yemen (formerly Aden and the Protectorate of South Arabia) became independent on Nov. 30, 1967

The economy is chiefly agricultural. The main crops are sorghum, sesame, millets, wheat and barley.

YUGOSLAVIA

Cap: Belgrade; **Area**: 255,804 sq. km;

Lang: Serbo-Croat, Slovene and Macedonian are spoken; **Rel**: Christian and Muslim; **Ex. R**: 32.922 Dinar=US $ 1.

Yugoslavia, a Balkan state, is made up of six republics—Serbia Croatia, Slovenia, Montenegro, Bosnia-Herzegovina and Macedonia. It lies between Italy, Austria, Hungary, Romania, Bulgaria, Greece and Albania, with a long seacoast on the Adriatic side.

The modern state of Yugoslavia has grown out of a petty principality Serbia which was independent since 1878.

Nearly one-third of Yugoslavia is forest. The chief crops are wheat, maize, and potatoes. The principal minerals are coal, iron, manganese and lead.

ZAIRE

Cap: Kinshasa; **Area**: 2,344,885 sq. km; **Lang**: French & Kiswahili, **Rel**: Christian & Animist; **Ex. R**: 3.1120 Zaire=US $ 1.

The Republic of Zaire was known until Oct. 1971 as the Democratic Republic of the Congo, or 'Congo (Kinshasa) for short. This change of name distinguished it from its neighbour, the Republic of the Congo or the Congo (Brazzaville). Zaire is surrounded by the Central African Republic, Sudan, Uganda, Rwanda, Burundi, Tanzania, Zambia, Angola, the Congo and the Atlantic Ocean into which the River Congo drains. In 1971 the country changed the name of River Congo to River Zaire. Originally a Belgian colony, Zaire became independent on June 30, 1960.

The major assets of Zaire are the Katanga copper mines and the diamond deposits in Kasai. The country is rich in other minerals like cobalt, cadmium, manganese, zinc and uranium. The forests abound in highclass wood like mahogany, ebony and teak. Principal agricultural products are coffee, palm oil and rubber.

ZAMBIA

Cap: Lusaka; **Area**: 752,620 sq. km; **Lang**: Bantu and English; **Rel**: Christian and Muslim; **Ex. R**: 0.82427 Kwacha=US $ 1.

Zambia, a landlocked republic in south central Africa, takes its name from the River Zambezi, one of its biggest rivers. Originally known as Northern Rhodesia, it is separated from Zimbabwe by the Zambezi river. Kariba Dam, one of the biggest man-made dams in the world, is on the Zambezi river where it makes the border between Zambia and Zimbabwe. It is bounded by Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia, Angola and Zaire.

Zambia became independent on 24th October 1964 and it is a republic within the Commonwealth.

Principal agricultural products are maize, tobacco, millet, cassava, groundnuts, cotton and sugar.

The country is rich in minerals including copper, zinc, cobalt, lead, uranium and manganese. Although copper mining dominates Zambia's economy, now accounting for 80% of the foreign exchange earnings, the country had made a major shift to agricultural production, as a result of the crippling fluctuations of copper prices in the world market.

ZIMBABWE (RHODESIA)

Cap: Salisbury; **Area**: 390,272 sq. km; **Lang**: English and Bantu; **Rel**: Tribal and Christian; **C. U**: Dollar.

Zimbabwe lies in south Central Africa with Mozambique to the east, Zambia to the north-west, Botswana to the south-west and South Africa to the south. Zimbabwe achieved independence after a bitter struggle against the white minority government in power.

Zimbabwe is rich in minerals notably copper, nickel, gold, asbestos, chrome and coal. The Wankie Colliery is the largest coal mine in the world. Industries include food processing, metals, textiles and engineering. Maize, groundnuts, cotton and tobacco are the chief crops, tobacco being the most important one.

81. DEPENDENCIES

All dependencies are remnants of the colonial empires established by European powers. None of them are sovereign.

Dependencies listed below are grouped under the following heads: 1. Australia, 2. Britain, 3. Chile, 4. Denmark, 5. Ecuador, 6. France, 7. Netherlands, 8. New Zealand 9. Norway, 10. Portugal, 11. Spain, 12. U.S.A.

1. AUSTRALIA

Australian Antarctic Territory. Area: 6,442,372 sq. km. A barren wasteland in Antarctica claimed by Australia in 1936.

Christmas Island. Area: 135 sq. km; Pop: 3260. An island in the Indian Ocean which Australia acquired in 1958. It is noted for its phosphate production.

Cocos (Keeling) Islands. Area: 14 sq. km. Pop. 1038; Cap: Bantam. The territory comprising 27 small islands in the Indian Ocean was given to the Clunies-Ross family by Queen Victoria in 1886. Australia brought the islands from the Clunies-Ross family for 7.2 million dollars in 1978.

Heard and McDonald Islands. Area: 368 sq. km. These islands in the Indian Ocean are uninhabited. They were transferred to Australia by Britain in 1947.

Norfolk Islands. Area: 30 sq. km; Pop: 2287; Cap: Kingston. These islands about 1000 miles from Australia are in the Tasman sea. There had been a settlement since 1856 when the descendants of the Bounty mutineers were transferred there from Pitcairn. (See Pitcairn infra).

2. BRITAIN

Most of the British colonies have acquired Associate Status and are no longer treated as dependencies.

Anguilla. Area: 91 sq. km; Pop. 6758; Cap: The Valley. Anguilla is one of the northernmost Caribbean islands. In 1976 Britain granted Anguilla local autonomy, with an elected Assembly. Anguillans are now demanding complete independence. Fishing is the main industry.

British Antarctic Territory. Area: over 100,000 sq. km. This territory comprises South Shetland Islands, South Orkney Islands and a large slice of territory on Palmer Peninsula, in Antarctica. They are mostly uninhabited.

British Indian Ocean Territory. Area: 78 sq. km; Pop: 2000. This territory in the Indian Ocean about 700 miles south of India covers the Chagos Archipelago. The three main islands in this group are Diego Garcia, Peros Banhos and Salomon Diego Garcia is a U S naval base now.

British Virgin Islands. Area: 153 sq. km; Pop: 12,796; Cap: Road Town. These comprise 36 islands and islets in the Caribbean Sea. It is governed by a crown administrator aided by a local council and a partly elected legislature. Livestock, fishing and farming form the main occupations.

Cayman Islands. Area: 259 sq. km; Pop: 11,194; Cap: Georgetown. The Cayman Islands in the Caribbean Sea comprise three main islands—Grand Cayman, Little Cayman and Cayman Brac. It is governed by an administrator assisted by a local council and an elected Assembly. The population is polyglot. Tourism is the main industry.

Falkland Islands. Area: 11,961 sq. km; Pop: 2010; Cap: Stanely. Falklands Crown Colony comprises two principal islands. East Falkland and West Falkland. South Georgia, a whaling settlement and South Sandwich Islands form part of the colony. These islands were settled at different times by the French, the British and the Argentinians. Argentina still claims these islands, which they call *Malvinas*.

In 1982 Argentina forcibly occupied these islands but they were finally re-occupied by Britain. The islands continue to be a bone of contention between Argentina and Britain.

Gibraltar. Area: 6 sq. km; Pop: 31,441. The Rock of Gibraltar, known as the key of the Mediterranean, is a peninsula jutting into the Mediterranean from Spain's southwest coast. Both Spain and France have laid claim to it. In 1967, a referendum voted overwhelmingly in favour of British control. This has not satisfied Spain, which still counts Gibraltar as part of its territory.

Hong Kong (see *Independent States)*

Pitcairn Islands. Area: 48 sq. km; Pop: 124; Cap: Adamstown. Pitcairn Islands include Pitcairn proper as well as three uninhabited islands, Henderson, Ducie and Oeno. They are about 1200 miles south of Tahiti. Pitcairn was located by the mutineers on H.M.S. Bounty, in 1790, when they were looking for an unknown hideout for themselves. They knew that if they were captured by the British navy, they would all be hanged. Therefore, after a sojourn of a few days at Tahiti, from where they took some women, they repaired to Pitcairn, which was uninhabited then. When Britain acquired control of the island in 1898, they transferred the descendants of the mutineers to Norfolk Island.

St. Helena. Area: 122 sq. km; Pop: 3200; Cap: Jamestown. St. Helena is in south Atlantic about 1200 miles west of Africa. St. Helena includes Ascension Island about 700 miles northwest of St. Helena and Tristan du Cunha and three other islands. St. Helena is famous in history as the island to which Napoleon was exiled after his defeat at Waterloo in 1815.

Turks and Caicos Islands. Area: 430 sq. km; Pop: 6228; Cap: Cockburn Town. The main islands of this group, in the Caribbean Sea, are Grand Turk and Salt Cay (Turks) and south and north Caicos (Caicos). In 1962, the islands were granted partial autonomy being administered by a Crown representative with the help of a local council and partly elected legislature. The population is mostly black. Salt, crayfish and sisal are the major exports.

3. CHILE

Easter Island. Cap: Hangaroa; Area: 163 sq. km; Pop: 1000. Easter Island is a volcanic island in the south Pacific about 2350 miles west of Chile. Its archaeological remains show that it had a very ancient civilization. The main occupation today is cultivation.

Juan Fernandez. Area: 148 sq. km; Pop: 615. This group of islands is located about 400 miles west of the Chilean coast. It contains two major islands—Robinson Crusoe and Alexander Selkirk. Daniel Defoe is believed to have based his story of Robinson Crusoe on the four-year confinement of the Scottish sailor Alexander Selkirk on the Robinson Crusoe island. Lobster fishing is the main occupation of the islanders.

Chilean Antarctic Territory. Area: 1,249,993 sq. km; Pop: 200—This is the portion of the Palmer peninsula of the Antarctic that Chile has claimed for its own.

Diego Ramirez Islands. This is a group of uninhabited islands, lying some 60 miles southwest of Cape Horn.

Salay Gomez, San Ambrosio and San Felix Islands. These are three separate uninhabited islands in the Pacific, which are in the possession of Chile.

4. DENMARK

Greenland. Area: 2,175,600 sq. km; Pop: 59862; Cap: Godthaab Greenland, the largest island in the world, lies to the north of North America. Around 84% of the surface is covered by an ice-cap with an average thickness of 500 feet. Most of the inhabitants are of mixed European and Eskimo origin. The main industry is fishing.

In 1979, Denmark handed over local government to the Greenlanders. Greenlandic (Eskimo language) replaced Danish as the official language. Foreign relations are controlled by Denmark.

Faeroe Islands. Area: 1399 sq. km; Pop. 41,929; Cap. Thorshavn. Faeroe islands lie in the Atlantic between Scotland's Shetland Islands and Iceland. The islands are 19 in number of which 17 are inhabited. The largest island is Stromo on which the capital Thorshavn stands. The main industry is fishing. The principal language is Faeroese. Home rule was granted in 1948. An elected Parliament controls the local administration. Two Faeroese delegates sit in the Danish Parliament.

5. ECUADOR

Galapagos Islands. Area: 7842 sq. km; Pop: 3100; Cap: Baquerizo Moreno. Galapagos islands are a group of 60 volcanic islands which lie in the Pacific, about 650 miles west of Ecuador. They have a unique assortment of fauna and were declared a National Park in 1936, so as to protect its wild life. The giant tortoise found on these islands is said to be the longest living animal in the world —with a life span of 200 years.

6. FRANCE

French Guiana. Area: 91,000 sq. km; Pop: 61,744; Cap: Cayenne. French Guiana is on the northern coast of South America. Devil's Island in Guiana served as a penal colony for France, for nearly a hundred years from 1852. In 1946, Guiana was made an overseas department of France with representation in French Parliament.

French Polynesia. Area: 4000 sq. km; Pop: 147,518; Cap: Papeete. The French Polynesian islands numbering around 130 lie in the south Pacific. For administrative purpose, they are grouped together as follows. 1. **Windward Islands** (including Tahiti and Moorea). 2. **Leeward Islands, 3. Tuamoto and Gambier Islands. 4. Austral Islands** and **5 Marquesas Islands**. The populaation is almost entirely Polynesian.

One of these islands—Muruora—

about 720 miles southeast of Tahiti was used as a nuclear testing site by France in 1966 and 1968.

Guadeloupe. Area: 1799 sq. km; Pop: 329,634; Cap: Basse-Terre. Guadeloupe proper comprises two islands—Basse-Terre and Grand Terre—separated by a narrow channel. They are in the Leeward Islands of Lesser Antilles. The islands of Marie Galante, Les Saintes, La Desirade and St. Barthelemy are part of Guadeloupe.

Martinique. Area: 1102 sq. km; Pop: 324,832; Cap: Fort-de-France. Martinique is one of the Windward Islands of Lesser Antilles. The island is mainly known for its volcanic mountain Mount Pelee, which erupted in 1902 in one of the most devastating earthquakes known to history. Martinique is an overseas department of France.

Mayotte. Area: 373 sq. km; Pop: 48518; Cap. Dzaoudzi. Mayotte lies in the Mozambique channel between East Africa and Zanzibar. A part of the Comoro Islands, Mayotte chose to remain a French dependency while the rest of the Comoros became independent in 1975.

New Caledonia. Area: 19058 sq. km; Pop: 147,536; Cap: Noumea. New Caledonia territory comprises several island groups in south Pacific, located about 750 miles east of Australia Besides New Caledonia, there are the Loyalty Islands, about 78 miles to the east (of New Caledonia), Chesterfield Islands, about 400 miles to the northwest and the Isle of Pines, about 30 miles to the south-east. New Caledonia has large reserves of nickel, iron, manganese and chrome. An overseas territory of France, it is administered by a governor, assisted by a popularly elected council.

Reunion. Area: 2510 sq. km; Pop: 509,855; Cap: St. Denis. Reunion is a volcanic island in the Indian Ocean and lies about 450 miles east of Madagascar. The island was settled by France in 1605. About 25 per cent of the population are of French extraction. The island has a prosperous economy based on sugar cane. It was made an overseas department of France in 1946.

St. Pierre and Miquelon. Area: 42 sq km; Pop: 5840; Cap: St. Pierre. These islands lie in the Atlantic Ocean about 15 miles southwest of Newfoundland. Most of the present population are descended from the early French and Basque settlers of the 17th century. Fishing is the main industry. The islands were made a department of France with local autonomy in 1975.

Southern and Antarctic Territory. Area: 7557 sq. km; Pop: 183; Cap: Port aux Francais. This territory comprises two archipelagos in the south Indian Ocean—Kerguelen and Crozet, two islands Saint Paul and New Amsterdam and an area on the mainland of Antarctica. Research stations, hospitals and army bases are located on Kerguelen and New Amsterdam islands. The rest of the territory is uninhabited.

Wallis and Futuna. Area: 200 sq. km; Pop: 9400; Cap: Mata Utu. Wallis and Futuna are two small groups of islands in the Pacific and lie about 250 miles west of Samoa. The population is largely Polynesian and the only occupations are connected with copra and fishing. Made an overseas territory of France in 1961, it is governed by an administrator assisted by a council made up of the chiefs of three main islands and three nominated members

7. NETHERLANDS

Netherlands Antilles. Area: 961 sq. km; Pop: 263,504; Cap: Willemstad. Netherlands Antilles consists of two groups of islands in the Caribbean sea—Windward islands and Leeward Islands. The Windward Islands comprise Curacao, Aruba and Bonaire. Leeward Islands include Saba, St. Eustatius and St. Maarten (part of St. Martin Island, shared with Guadeloupe). The Windward Islands are volcanic and largely arid but Curacao and Aruba yield oil and have a prosperous economy based on petroleum and phosphate. Mining is another paying occupation. The Netherlands Antilles became a co-equal part of the Kingdom of Netherlands in 1954. The movement for independence is gaining ground in the islands.

8. NEW ZEALAND

Cook Islands. Area: 234 sq. km; Pop: 18,127; Cap: Avarua. The Cook Islands are a group of small islands in south Pacific. Rarotonga is the largest island on which the capital Avarua stands. They became a British protectorate in 1888 and were annexed to New Zealand in 1901. Under a constitution adopted in 1965, the islands have full internal self-government in association with New Zealand.

Niue. Area: 259 sq. km; Pop: 3556; Cap: Tutukla. Niue, geographically part of the Cook islands, has been separately administered since 1903. In 1974, Niue was granted self-government with a Prime Minister and a 14-member elected assembly.

Ross Dependency. Area: 414,398 sq. miles. This territory consists of part of the mainland of Antarctica and some islands. New Zealand claimed this territory in 1923. The region includes a whaling centre and a research station.

Tokelau. Area: 10 sq. km; Pop: 1700. This territory comprises 3 atolls about 300 miles north of Western Samoa. Once part of the Gilbert and Ellice islands, they were made New Zealand territory in 1925. The population is Polynesian. Copra is the major export.

9. NORWAY

Bovet Island. Uninhabited island in South Atlantic. Became a dependency of Norway in 1930.

Peter I Island. Uninhabited island in Antarctica. Became a dependency in 1933.

Queen Maud Land. An area in Antarctica claimed by Norway in 1939.

10. PORTUGAL

Azores Islands. Area 2336 sq. km; Pop: 250,892; Cap: Porta Delgade. The islands of Azores are in the Atlantic Ocean, about 750 miles west of Europe. The Azores group includes 9 main islands and several smaller ones. The U.S. maintains an air base on Terceira island in the Azores. In 1976, internal self-government was granted to the Azores. Bu the Azoreans are clamouring for independence.

Macao (see *Independent States*)

Madeira Islands. Area: 795 sq. km; Pop: 267,491; Cap: Funchal. Madeira lies in the Atlantic Ocean 600 miles south west of Portugal. The islands comprise two principal islands—Madeira and Porto Santo—and several smaller islands, which are uninhabited. In 1976 Portugal granted Madeira full internal autonomy (see Box).

11. SPAIN

Balearic Islands. These islands are in the Mediterranean off the south coast of Spain. Majorca, Minorca, Ibiza and Formentera are the largest islands. The islands had a very ancient civilization dating from the Phoenicians. Spain granted limited autonomy to these islands in 1978.

Box 33
Madeira Wine

Madeira, famous for its special brand of wine, is a group of islands in the Atlantic, southwest of Azores. The famous Madeira wine was discovered by the sheerest accident. Some two centuries ago, a consignment of wine sent from Madeira to the West Indies was returned undelivered. When the returned bottles were opened, it was found the wine had acquired a unique flavour. The hot humid air of the tropics had played the trick. Thereafter, the wine was stored and allowed to mature under tropical conditions. And Madeira wine became famous the world over.

Canary Islands. Area: 7273 sq. km; Pop: 1,256,650; Cap: Las Palmas and Santa Cruz. The Canary Islands lie in the Atlantic off the north west coast of Morocco. Of the 13 islands comprising the group, the largest are Grand Canary, Tenerife and Fuerte Ventura. In 1927 the islands were divided into two provinces—one with its capital at Las Palmas on Grand Canary and the other with its capital at Santa Cruz on Tenerife.

The islands are volcanic and mountainous, the highest peak Pico de Teide in Tenerife rising above the snow level to 12,198 feet.

The islands received the name from the Latin word *Canis*, meaning dog, on account of the fierce dogs that were found there. The species of song birds called *Canary* were first discovered on these islands, centuries ago by the Phoenicians. Spain acquired dominion over the islands in 1479.

12. U.S.A.

Guam. Area: 500 sq. km; Pop: 70,000; Cap: Agana. An island in the Indian Ocean administered by U.S. as an 'unincorporated' territory.

Midway Islands. Area: 5 sq. km; Pop: 2356. A group of islands in north Pacific Ocean, an incorporated territory of U.S.

Marshall Caroline and Marina Islands. Area: 1500 sq. km; Pop: 126,440; Cap: Saipan. U.S. Trust Territory in the Pacific under a High Commissioner.

Wake Island. Area: 6 sq. km; Pop: 1763. U.S. unincorporated territory in the Pacific.

82. HEADS OF STATES

Afghanistan. Pr. Babrak Karmal, Dec. 27, 1979. P.M: Soltan Ali Keshtmand, June 11, 1981.

Albania. P.M: Adil Carcani, Jan. 15, 1982.

Algeria. Head of State: Pr. Chadli Benjedid, Feb. 9, 1979. P.M: Benahmed Abdelghani, Mar. 8, 1979

Andorra. French Co-Prince: Francois Mitterand (Pr. of the French Rep.). Spanish Co-Prince: Joan Marti Alanis (Bishop of Urgel).

Angola. Head of State & Govt: Pr. Jose Eduardo Dos Santos, Sept. 21, 1979. F.M: Paulo Teixera Jorge, Nov. 28, 1976.

Argentina. Head of State & Govt. Pr. Maj. Gen. Reynaldo Benito Antonio Bignone, July 1, 1982. F.M: Juan Ramon Aguirre Lanari, July 2, 1982.

Australia. Head of State. Queen Elizabeth II, Feb. 2, 1952. G. G. Sir Ninian Stephen, July 29, 1982. P.M: John Malcolm Fraser, Dec. 15, 1975.

Austria. Head of State. Pr. Rudolf Kirchschlaeger, July 8, 1974. Head of Govt. Chancellor Bruno Kreisky, April 21, 1970.

Bahamas. G.G: Sir Gerald C. Cash, Sept. 1979. P.M: Lynden O. Pindling, July 10, 1973.

Bahrain. Head of State (Emir). Sheik Isa bin Sulman al Khalifah, Nov. 2, 1961. P.M: Sheik Khalifah bin Sulman al Khalifah, Jan. 9, 1970.

Bangladesh. Head of State. Pr. A.F.M. Ahsanuddin Chowdhury, March 26, 1982. Chief Martial Law Administrator: Lt. Gen. Hossain Mohammed Ershad March 24, 1982.

Barbados. Head of State: Queen Elizabeth II, Nov. 30, 1966. G.G: Sir Deighton Harcourt Lisle Ward, Nov. 17, 1976. P.M: J.M.G. Adams, Sept. 8, 1976.

Belgium. Head of State: King Baudouin, July 16, 1951. P.M: Wilfried Martens, Dec. 17, 1981.

Belize. P.M: George Price, Sept. 21, 1981.

Benin. Head of State: Pr. Ahmed (Mathieu) Kerekou, Oct. 27, 1972. P.M: Mathieu Kerekou, Oct. 21, 1974.

Bermuda. Head of State: Queen Elizabeth II, Gov. Sir Richard Posnett, Feb. 24, 1981. P.M: John Swan, Jan. 16, 1982.

Bhutan. Head of State & Govt. King Jigme Singye Wangchuk, July 21, 1972. F.M: Dasho Dawa Tsering, July 1974.

Bolivia. Head of State & Govt. Pr. Dr. Herman Siles Zuaso, Oct. 10, 1982.

Botswana. Head of State: Pr. Quett Masire, July 18, 1980.

Brazil. Head of State: Pr. Gen. Joao Baptista Figueiredo, March 15, 1979.

Bulgaria. Head of State. Pr. Todor Zhivkov, July 7, 1971. P.M: Grisha Filipov, June 17, 1981.

Burma. Head of State. Pr. U San Yu, Nov. 1981.

Burundi. Head of State. Pr. Col. Jean-Baptiste Bagaza, Nov. 10, 1976. F.M: Edouard Nzambimana, Oct. 13, 1978.

Cameroon. Head of State: Pr. Ahmadou Ahidjo, May 5, 1960.

Canada. Head of State. Queen Elizabeth II, Feb. 8, 1952. GG: Edward R. Schreyer, Jan. 22, 1952. P.M: Pierre Elliott Trudeau, March 3, 1980.

Cape Verde. Pr. Aristides Pereira, July 5, 1975. P.M: Pedro Pires, July 15, 1975.

Central African Republic. Head of State and Govt: Gen. Andre Kolingba, Sept. 2, 1981. F.M: Lt. Col. Jean-Louis Gerul Yambala, Sept. 2, 1981.

Chad. Head of State and Govt. Pr. Goukouni Queddei, Aug. 21, 1979. F.M: Acyl Ahmat, Nov. 10, 1979

Note Pr. President
PM Prime Minister / Premier
FM Foreign Minister
GG. Governor General
Gov Governor

Chile. Head of State and Govt. Pr. Augusto Pinochet Ugarte, Dec. 17, 1974. F.M: Rene Rojas Galdames, April 2, 1980.

China, People's Republic of: Chairman of the Central Committee: Ye Jianying, March 5, 1978. Head of Govt. P.M: Zhao Ziyang, Sept. 10, 1980.

Colombia. Head of State & Govt. Pr. Julio Cesar Turbay Ayala, Aug. 7, 1978 F.M: Carlos Lemos Simmonds, March 16, 1981.

Comoro Is. Head of State: Ahmed Abdullah, Oct. 22, 1978. Head of Govt. P.M: Ali Mroudjae, Feb. 8, 1982.

Congo, People's Rep. of: (Brazzaville). Pr. Denis Sassou-Nguesso, Feb. 8, 1979. P.M: Louis Sylvain Ngome, Dec. 15, 1975.

Costa Rica. Head of State & Govt: Pr. Luis Alberto Monge Alvarez, May 8, 1982. F.M: Fernando Volio Jimenez, May 8, 1982.

Cuba. Head of State & Head of Govt (Council of State President): Fidel Castro Ruz, Dec. 3, 1976. First Vice President: Raul Castro Ruz, Dec. 3, 1976.

Cyprus. Head of State and Govt: Spiros Kyprianou, Aug. 31, 1977. F.M: Nicos Rolandis, March 8, 1978.

Czechoslovakia: Pr. Gustav Husak, May 19, 1975. P.M: Lubomir Strougal, Jan. 28, 1970.

Democratic Kampuchea. As of Jan. 8, 1979 there were two rival Governments in Kampuchea. Under the 1976 Constitution Head of State: Khieu Samphan, April 5, 1976. P.M: Khieu Samphan, Dec. 21, 1979. The rival Vietnamese-backed government is led by Pr. Heng Samrin, Jan. 8, 1979 and F.M: Hun Sen, Jan. 8, 1979.

Denmark. Head of State: Queen Margarethe, II, Jan. 14, 1972. P.M: Poul Shueter, Sept. 3, 1982.

Djibouti, Rep. of: Pr. Hassan Gouled Aptidon, Jan. 27, 1977. P.M: Barkat Gourad Hamadore, Sept 30, 1978.

Dominican Rep. Pr. Antonio Guzman, Aug. 16, 1978. F.M: Manuel Enrique Tavares, Feb. 27, 1981

Ecuador. Head of State & Govt. Pr Osvaldo Hurtado Larrea, May 24, 1981. F.M: Luis Valencia Rodriquez, Nov. 4, 1981.

Egypt, Arab Rep. of: Head of State Pr & P.M: Hosni Mubarak, Oct. 14, 1981.

El Salvador. Pr. (Provisional): Alfredo Magana Borja, May 2, 1982. Vice Presidents: Raul Molina Martinez, May 2, 1982; Maurcio Gutierrez Castro, May 2, 1982 and Pablo Mauribo Alvergue, May 2, '82.

Equatorial Guinea. Head of State & Govt. Head of Military Council: Lt. Col. Teodoro Obiang Nguema Mbasogo, Aug. 3, 1979.

Ethiopia. Head of State & Govt. Provisional Military Council Chairman: Lt. Col. Mengistu Haile Mariam, Feb. 11, 1977. F.M: Col. Feleke Gedle-Ghiorgis, March 11, 1977.

Fiji: Head of State: Queen Elizabeth II represented by GG: Ratu Sir George Cakobau, Dec. 1972. P.M: Ratu Sir Kamisese K. T. Mara, Oct. 10, 1970.

Finland. Head of State: Pr. Mauno Koivisto, Jan. 27, 1982. P.M: Kalevi Sorsa, Feb. 12, 1982.

France. Head of State: Pr. Francois Mitterrand. P.M: Pierre Mauroy, June 20, 1981.

Gabon. Pr. Albert-Bernard (Omar) Bongo, Nov. 28, 1967. P.M: Leone Mebiame, April 16, 1975.

Gambia. Head of State and Govt. Pr. Sir David (Dauda) B. Jawara, April 24, 1970. F.M: Lamine Jabang, April 9, 1977.

Germany (East): Head of State: (Chairman of the Council of State): Erich Honecker, Oct. 29, 1976 Head of Govt. (Chairman of the Council of Ministers): Willi Stoph, Oct. 29, 1976.

Germany (West): Head of State (Federal President): Karl Carstens, July 1, '79. Federal Chancellor: Helmut Kohl, Oct. 2, 1982.

Ghana. Head of State & Govt. Pr. (Provisional National Defence Council Chairman): Flt. Lt. Jerry Rawlings, Jan. 12, 1982. F.M: Obed Asamoah, Jan. 21, 1982.

Greece: Pr. Constantine Caramanlis, May 15, 1980. P.M: Andreas Papendreou, Oct. 19, 1981.

Grenada. G.G: Sir Paul Scoon: Head of

Govt. (Provisional Revolutionary) P.M: Maurice Bishop, March 25, 1979.

Guatemala. Head of State & Govt: Pr. Gen. Efrain Rios-Montt, June 9, 1982. F.M: Eduardo Castillo Arriola, May 25, 1982.

Guinea: Pr. Ahmed Sekou Toure, Oct. 2, 1958. P.M: Louis Lansana Beavogul, April 26, 1972.

Guinea Bissau: Pr. Joao Barnardo Vieira, Nov. 14, 1980. F.M: Victor Saude Maria, Nov. 14, 1980.

Guyana. Executive Pr. Linden, Forbes Burnham, Oct. 6, 1980. P.M: Ptolemy A. Reid, Oct. 6, 1980.

Haiti. Pr. Jean Claude Duvalier, April 21, 1971. F.M: Jean Robert Estime, Feb. 3, 1982.

Honduras. Head of State and Govt. Pr Roberto Suazo Cordova, Jan. 27, 1982. F.M: Edgardo Paz Barnica, Jan. 27, 1982.

Hong Kong. Gov. Sir Eduard Youde, May 20, 1982. Chief Secretary: C.P. Haddon-Cave, 1981.

Hungary. Pr. Pal Losonczi, April 14, 1967. P.M: Gyorgy Lazar, May 15, 1975

Iceland. Pr. Eldjarin. P.M: Gunnar Thoroddsen, Feb. 8, 1980.

India. Head of State: Pr. G. Zail Singh, July 25, 1982. Vice-President: M. Hidayatullah, Aug. 31, 1979. P.M. ~~Smt. Indira~~ Gandhi, ~~Jan. 14,~~ 30 198~~0~~4 Rajiv

Indonesia. Head of State and Govt. Pr. Suharto, Mar. 27, 1968. Overseas Affairs Minister: Gen. Maraden Panggabean, Mar. 29, 1978.

Iran. Pr. Ayatollah Hojatoleslam Ali Khamenei, Oct. 13, 1981. P.M: Mir Hussein Musavi, Oct. 1981.

Iraq. Head of State and Govt. Pr. and Premier: Sadam Hussein Takriti, July 16, 1979. F.M: Saadoun Hammadi, Nov. 12, 1974.

Ireland. Head of State. Pr. Patrick John Hillery, Dec. 3, 1976. P.M: Charles J. Hughey, March 9, 1982.

Israel. Pr. Yitzhak Navon, May 29, 1978. P.M: Menachem Begin, June 21, 1977.

Italy. Head of State. Pr. Sandro (Alessandro) Pertini, July 9, 1978. P.M: Giovanni Spadolini, June 28, 1981.

Ivory Coast. Pr. Felix Houphouet-Boigny, Nov. 27, 1960. F.M: Simon Ake, July 20, 1977.

Jamaica. Head of State: Queen Elizabeth II. GG: Florizel Augustus Glasspole. June 27, 1973. P.M: Edward Seaga, Nov. 1, 1980.

Japan. Head of State. Emperor Hirohito, **Dec. 25, 1926. P.M.: Yasuhiro Nakasone, November, 1982.**

Jordan. Head of State. King Hussein Ibn Talal, May 2, 1953. P.M: Mudar Badran, Aug. 28, 1980.

Kenya. Head of State and Govt. Pr. Daniel Arap Moi, Oct. 14, 1978. F.M. Robert Ouko, Nov. 28, 1979.

Korea (North) Pr. Kim Il Sung, Dec. 28, 1972. P.M: Li Jong Ok, Dec. 15, 1977.

Korea (South) Head of State. Pr. Chun Du Hwan, Aug. 27, 1980. P.M: King Sang Hyup, June 24, 1982.

Kuwait. Head of State (Amir) Sheik Jaber al-Ahmed al-Sabah, Dec 31, 1977. P.M: Sheik Saad al-Abdullah al-Salem al-Sabah, Feb. 8, 1978

Laos. Pr. Prince Souphanouvong, Dec. 3, 1975. Supreme Adviser to the President: Former King Savang Vathana, Dec. 3, 1975. P.M: Kaysone Phoumvihan, Dec 1975.

Lebanon. Pr. Amin Gemayel Sept. 23, 1982. P.M: Chafik al-Wazzan, Oct. 26, 1980

Lesotho. Head of State: King Moshoeshoe II, Oct. 4, 1966 P.M: Leabua Jonathan, Oct. 4, 1966.

Liberia. Pr. Samuel K. Doe, April 12, 1980. F.M: Maj. Henry Boimah Fahnbullah, Jr., Nov. 26, 1981

Libya. Head of State: Col. Muamar Ghaddafi, Sept. 8, 1969. F.M: Abdel Ati al-Obeidi, Jan. 7, 1981

Liechtenstein. Head of State. Pr: Prince Franz Josef II, July 25, 1938. P.M Hans Brunhart, April 26, 1978

Luxembourg. Head of State: Grand Duke Jean, Nov. 12, 1964. P.M: Pierre Werner, July 19, 1979

Macao. Governor: Cdr. Vasco Almeida e Costa, June 17, 1981

Malagasy Rep. (Madagascar): Head of State: High Revolutionary

Council Chairman: Comdr. Didier Ratsiraka, June 16, 1975. Head of Govt. Lt. Col. Desire Rakotoarijaona, Aug. 4, 1977.

Malawi. Pr. and P.M: Hastings Kamuzu Banda, July 6, 1966.

Malaysia. Head of State: King Tuanku Ahmed Shah Ibni Al-Marhum, March 29, 1979. P.M: Mahathir bin Mohammed, July 18, 1981.

Maldives. Head of State and Govt. Pr. Maumoon Abdul Gayoom, Nov. 11, 1978.

Mali. Pr. & P.M: Moussa Traore, Nov. 19, 1968. F.M: Alione Blondin Berje, July, 1978.

Malta. Pr. Agatha Barbara, Feb. 16, 1982. P.M: Dom Mintoff, June 17, 1971.

Mauritania. Head of State. Pr: Mohammed Khouna Ould Haydalla, Jan. 4, 1980. P.M: Lt. Col. Maouya Ould Sidi Ahmed Taya, April 25, 1981.

Mauritius. Head of State. Queen Elizabeth II. GG: Davendranath Burrenchobay, March 23, 1978. P.M: Aneerood Jugnauth, June 14, 1982.

Mexico. Head of State. Pr. Miguel de la Madrid Hurtado, Dec. 1. 1982. F.M: Jorge de la Rosa Castanada, May 16, 1979.

Monaco. Head of State. Prince Rainier III, May 9, 1949. Minister of State: Francois Didier Gregh, April 2, 1969.

Mongolia. Chairman of the Presidium, Yumzhagiyu Tsedenbal, June 11, 1974.

Morocco. Head of State: King Hassan II, Feb. 26, 1961. Head of Govt. Premier Maati Bouabid, March 27, 1979.

Mozambique. Head of State and Govt. Pr. Samora Moises Machel, June 25, 1975. F.M: Joaquim Chissano, June 25, 1975.

Nauru. Pr. Hammer de Roburt, May 11, 1978.

Nepal. Head of State. King Birendra Bir Bikram Shah Dev, Jan. 31, 1972. P.M: Surya Bahadur Thapa, May 30, 1979.

Netherlands. Head of State: Queen Beatrice. P.M: Andreas Van Agt, Dec. 19, 1977.

New Zealand. Head of State: Queen Elizabeth II, Feb. 2, 1952 GG: Sir David Beattie, Oct. 25, 1980. P.M: Robert D. Muldoon, Dec. 12, 1975.

Nicaragua. Govt. headed by a three-man junta consisting of Sergio Ramirez Mercado, Rafael Cordova Rivas and Daniel Orteza Saavedra, May 1981.

Niger. Head of State and Govt. (Supreme Military Council President): Col. Seynid Kountche, April 17, 1974. F.M: Daouda Diallo, Sept. 10, 1979.

Nigeria. Head of State and Govt. Pr. Shehu Shagari, Oct. 1, 1979. F.M: Ishaya Audu, Jan. 1, 1980.

Norway. Head of State: King Olav V, Sept. 21, 1957. P.M: Karre Willoch, Oct. 14, 1981.

Oman, Sultanate of. Head of State & Govt. Sultan Qabus bin Said, July 24, 1970. F.M: Qais Abdul Munim al Zawawi.

Pakistan. Head of State. Mohammed Zia-Ul-Haq, Sept. 16, 1978. Head of Govt. Chief Martial Law Administrator, July 5, 1977. F.M: Shahbzaba Yakoub Khan, Feb. 16, 1982.

Panama. Head of State: Pr. Aristedes Royo, Oct. 11, 1978. F.M: Jorge Illueca, Jan. 27, 1981.

Papua New Guinea. GG: Tore Lokoloko, Feb. 28, 1977. P.M: Michael Somare, Aug. 1982.

Paraguay. Head of State and Govt. Pr. Gen. Alfredo Stroessner, Aug. 15, 1954. F.M: Alberto Nogues, March 9, 1976.

Peru. Pr. Fernando Belaunde Terry, July 28, 1980. P.M: Manuel Ulloa Elias, July 28, 1980.

Philippines. Pr. Ferdinand E. Marcos, Dec. 30, 1965. P.M: Cesar E. A. Virata, July 27, 1981.

Poland. Head of State, Chairman of the Council of State: Henryk Jablonski, March 28, 1972. P.M: Gen. Wojciech Jaruzelski, Feb. 9, 1981

Portugal. Pr. Gen. Antonio Ramalho Eanes July 14, 1976. P.M: Francisco Pinto Balsemavo, Jan. 1981.

Qatar. Head of State (Amir) Sheik Khalifah bin Hamad al Thani, Feb. 22, 1972. P.M: Sheik

Khalifah bin Hamad al Thani, May 29, 1970.

Romania. Head of State: Pr. Nicolae Ceausescu, March 28, 1974. P.M: Constantin Dascalescu, May 21, 1982.

Rwanda. Pr. Maj-Gen. Juvenal Habyarimana, July 5, 1973. F.M: Francois Ngarukiyintwah, Jan. 11, 1979.

San Marino. Captains-Regent: Marino Benedetto Bel Luzzi IV & Guiseppe Micheloni II, April 1, 1972. F.M: Gian-Luigi Berti.

Sao Tome & Principe. Head of State: Pr. Manuel Pinto da Costa, July 15, 1975. P.M: Manuel Pinto de Costa, March 1980.

Saudi Arabia. Head of State & Govt: King Fahd Ibn Abdel Aziz al Said, June 13, 1982. F.M. Prince Saud Ibn Faisal, Oct. 13, 1975.

Senegal. Pr. Abdou Diouf, Jan. 1, 1981. P.M: Habib Thaim, Jan. 1, 1981.

Seychelles. Head of State & Govt. Pr. F. Albert Rene, June 5, 1977. F.M: Jacques Hodoul, June 28, 1979.

Sierra Leone. Pr. Siaka Stevens, April 21, 1971. F.M: Abdulai Conteh, May 1977

Singapore. Head of State: Pr. Chengaraveettil Devan Nair, Oct. 24, 1981. P.M: Lee Kuan Yew, June 5, 1959.

Somalia. Head of State & Govt. Pr. Gen. Mohammed Ziyad Barre, Nov. 1, 1969. F.M: Abderrahman Jama Barreh, July 27, 1977.

South Africa. Head of State: Pr. Marais Viljoen, June 19, 1979. Head of Govt. Pieter Wilhelm Botha, Sept. 28, 1978.

Spain. Head of State: King Juan Carlos de Borbon, Nov. 22, 1975. P.M: **Felipe Gomzalez, Oct. 30, 1982.**

Sri Lanka. Pr. J. R. Jayawardene, Feb. 4, 1978. P.M: Ranasinghe Premadasa, Feb. 4, 1978.

Sudan. Head of State & Govt. Pr. Gen. Gafaar al-Nimeiry, Oct. 12 1971. F.M: Muhammad Mirghani Mubarak, May 1981.

Surinam. Head of State: Pr. Henk Chin A. Sen, Aug. 14, 1980. P.M: Henk Chin A. Sen, Mar. 15, 1980.

Swaziland. Head of State: King Sobhuza II, since 1921. P.M: Prince Mandabela Fred Dlamini, Oct 23, 1978.

Sweden. Head of State: King Carl XVI Gustav, Sept. 15, 1973. P.M: Olaf Palme, Oct. 22, 1982.

Switzerland. Head of State: Pr. Fritz Honegger, Jan. 1, 1982. F.M: Pierre Aubert, Feb. 1, 1978.

Syria. Pr. Hafez al-Assad, March 14, 1971. P.M: Abdel Raouf al-Kasm, Jan. 9, 1980

Taiwan. Pr. Chiang Chinq-Ku, May 30, 1978. P.M: Sun Yun-Suan, May 20, 1978.

Tanzania. Head of State: Pr. Julius K. Nyerere, April 27, 1964. Vice Pr. Aboud Jumbe, April 12, 1972. P.M: Cleopa Msuya, Nov. 7, 1980.

Thailand. Head of State: King Phumiphon Abuldet, May 5, 1955. P.M: Prem Tinsulanonda, March 3, 1980.

Togo: Pr. Etiemnne Eyadema, April 14, 1967. F.M. Anani Akakpo-Ahianyo, July 24, 1978.

Tonga Head of State: King Taufaahu Topou IV: P.M: Prince Fatafehi Tuipelehake, July 4, 1967.

Trinidad & Tobago. Head of State: Pr Ellis Emmanuel Innocent Clarke, Aug. 1, 1976. P.M: George Chambers, Mar. 30, 1981.

Tunisia. Pr. Habib Bourgiba, July 25, 1957. P.M: Mohammed Mzali, Aug. 23, 1980.

Turkey. Military Govt. headed by Gen. Kenan Evren, Sept. 20, 1980 P.M: Bulent Ulusu, Sept. 20, 1980

Uganda. Pr. Milton Obote. P.M: Otema Alimadi, Dec. 18, 1980.

United Arab Emirates. Head of State. Pr Sheik Zaid bin Sultan al Nahayan (of Abu Dhabi), Dec. 2, 1971 Head of Govt. Sheik Rashid bin Said al-Maktoum (of Dubai), April 30, 1979.

U.S.A. Pr. Ronald Reagan, Jan. 20, 1981. Vice-Pr: George Bush, Jan. 20, 1981. Secretary of State. George P. Shultz, June 26, 1982

United Kingdom. Head of State: Queen Elizabeth II, Feb. 2, 1952. P.M: Mrs. Margaret Thatcher, May 4, 1979

U.S.S.R. Chairman of the Presidium of the Supreme Soviet (Head of

Nicholai Ta

State): ~~Y. V. Andropov, November~~ 1~~982~~. Premier (Chairman of the Council of Ministers): P.M: Nicholai A. Tikhonov, Oct. 23, 1980

Upper Volta. Head of State & Govt. Col Saye Zerbo, Dec. 7, 1980. F.M: Lt. Col. Felix Tiemtaraboum. Dec 7, 1980.

Uruguay. Pr. Gregorio C. Alvarez, Sept 1, 1981.

Vanuatu. Pr. George Ati Sokomanu. P.M. Walter Livi.

Vatican. Supreme Pontiff: Pope John Paul II (Karol Wojtyla). Secretary of State: Cardinal Agostino Casaroli, April 30, 1979.

Venezuela. Pr. Luis Herrera Campins, March 12, 1979. F.M: Jose Alberto Zambrano, March 12, 1979.

Vietnam. Council of State: Pr. (Actg) Nguyen Huu Tho, April, 1980. P.M. Phan Van Dong, July 2, 1976.

Western Samoa. Chief of State: Chief Malietoa Tanumafili, April 1963. P.M: Vaai Kolone, April 1982.

Yemen (North), Arab Rep. of : Head of State: Ali Abdullah Saleh, July 17, 1978. P.M: Abdel Karim Iryani, Oct. 15, 1980.

Yemen (South), People's Dem. Rep. of : Pr. Ali Nasser Mohammed Hassani, April 21, 1980. P.M: Ali Nasser Mohammed Hassani, Aug. 2, 1971. F.M: Salim Salih Muhammad, Aug. 11, 1979.

Yugoslavia. Head of State: Pr. of the Republic: Sergei Krajger, May 15, 1981. Head of Govt. Federal Executive Council President. Veselin Djuranovic, Feb. 18, 1977.

Zaire. Pr. Gen. Mobutu Sese Seko, Nov. 25, 1965. P.M: Nsinga Udjuu, April 23, 1982.

Zambia. Head of State: Pr. Kenneth David Kaunda, Oct. 24, 1964. P.M: Nalumino Mundia, Feb. 18, 1981.

Zimbabwe. Head of State: Pr. Canaan Banana, April 18, 1980. P.M: Robert G. Mugabe, March 11, 1980.

83. NOBEL PRIZES

Alfred Bernhard Nobel (1833—1896), inventor of dynamite, who died on December 10, 1896 bequeathed $ 9,000,000, the interest to be distributed yearly to those who had most benefited mankind during the preceding year in different spheres.

Awards for Physics and Chemistry are made by the Swedish Academy of Science; Medicine or Physiology by the Stockholm Faculty of Medicine; Literature by the Swedish Academy of Literature; Peace by five persons elected by the Norwegian Parliament (Storting). The Fund is managed by a board of directors, the head of which is appointed by the Swedish Government. Nobel Prize in Economics, known as the "Alfred Nobel Memorial Prize in Economic Science", was instituted by the Central Bank of Sweden, to mark its tercentenary in 1968. The prize was first awarded in 1969.

1. Physics

1901 W.K. Roentgen (Germany)
1902 H.A. Lorentz and P. Zeeman (Holland)
1903 A.H. Becquerel, Pierre & Marie Curie (France)
1904 Lord Rayleigh (England)
1905 Philipp Lenard (Germany)
1906 J.J. Thomson (England)
1907 A.A. Michelson (USA)
1908 G. Lippmann (France)
1909 G. Marconi (Italy) and F. Braun (Germany)
1910 J.D. van der Waals (Holland)
1911 W. Wien (Germany)
1912 Gustaf Dalen (Sweden)
1913 H. Kamerlingh-Onnes (Netherlands)
1914 M. von Laue (Germany)
1915 W. H. Bragg and W. L. Bragg (England)
1916 No Award
1917 C.G. Barkla (England)
1918 Max von Planck (Germany)
1919 J. Stark (Germany)
1920 C.E. Guillaume (Switzerland)
1921 A. Einstein (Germany)
1922 Niels Bohr (Denmark)
1923 R. A. Millikan (USA)
1924 Karli Siegbahn (Sweden)
1925 James Franck & Gustav Hertz (Germany)
1926 Jean B. Perrin (France)
1927 Arthur Compton (USA) & Charles T.R. Wilson (England)
1928 O.W. Richardson (England)

1929 L.V. de Broglie (France)
1930 C.V. Raman (India)
1931 No Award
1932 W. Heisenberg (Germany)
1933. Paul A.M. Dirac (England) & Erwin Schroedinger (Austria)
1934 No award
1935 J. Chadwick (England)
1936 V.F. Hess (Austria) and C.D. Anderson (USA)
1937 C.J. Davisson (USA) and G.P. Thomson (England)
1938 E. Fermi (Italy)
1939 E.O. Lawrence (USA)
1940–42 No Award
1943 Otto Stern (USA)
1944 Isidor I. Rabi (USA)
1945 W. Pauli (Austria)
1946 P.W. Bridgman (USA)
1947 Sir E. Appleton (England)
1948 P.M. S. Blackett (England)
1949 Hideki Yukawa (Japan)
1950 C.F. Powell (England)
1951 Sir John Cockcroft (England) and E.T.S. Walton (Ireland)
1952 E.M. Purcell and Felix Bloch (USA)
1953 Fritz Zernike (Netherlands)
1954 S. Max Born (England) and Walther Bothe (Germany)
1955 Willis E. Lamb and Polykarp Kusch (USA)
1956 Walter H.Brattain, William Shockley and John Bardeen (USA)
1957 Tsung Dao Lee and Chen Ning Yang (USA) (b. China)
1958 Pavel A. Cerenkov, Ilya M. Frank and Igor E. Tamm (USSR)
1959 Emilio Segre and Owen Chamberlain (USA)
1960 Donald A. Glaser (USA)
1961 Robert Hofstadter (USA) & R.L. Mossbaur (Germany)
1962 Lev. Dr. Landau (USSR)
1963 Eugene P. Wigner (USA), Maria Goeppert—Mayer (USA) & J. Hans D. Jenen (Germany)
1964 Charles H Towns (USA), Nikolai G. Basov & A.M. Prokhorov (USSR)
1965 Shinichero Tomonaga (Japan), Julian Schwinger & Richard P. Feynman (USA)
1966 Alfred Kastler (France)
1967 Hans A. Bethe (W. Germany)
1968 Luis W. Alvarez (USA)
1969 Murray Gell-Mann (USA)
1970 Louis Neel (France) and Hannes Alfven (Sweden)
1971 Denis Gabor (Britain)
1972 John Bardeen ״
John Schrieffer ״
Leow Cooper (USA)
1973 Leo Esaki (Japan)
Ivar Giaevar (USA)
Brian D. Josephson (UK)
1974 Martin Ryle (UK) and Antony Hewish (UK)
1975 James Rainwater (USA)
Age Bohr (Denmark) and
Ben Mottleson (Denmark)
1976 Burton Richter (USA)
Samuel C.C. Teng (USA)
1977 Philip W. Anderson (USA)
Sir Neville Mott (England)
John H. Van Vleck (USA)
1978 1. Pyotr Leontevitch Kapitsa (USSR) Half the prize amount
2. Arno A. Penzias (USA)
3. Robert W.Wilson (USA)
1979 Sheldon S. Glashow (USA)
Steven Weinberg (USA) &
Abdus Salam (Pakistan)
1980 James W. Cronin and Val L. Fitch (USA)
1981 Nicolaas Blombergen (Dutch), Arthur Shawlow (USA) & Kai Siegbahn (Sweden)

2. Chemistry

1901 J.H. vant Hoff (Holland)
1902 Emil H. Fischer (Germany)
1903 S.A. Arrhenius (Sweden)
1904 Sir W. Ramsay (England)
1905 Adolf von Baeyer (Germany)
1906 Henri Moissan (France)
1907 E. Buchner (Germany)
1908 Ernest Rutherford (England)
1909 Wilhelm Ostwald (Germany)
1910 Otto Wallach (Germany)
1911 Marie Curie (France)
1912 F.A.V. Grignard and P. Sabatier (France)
1913 Alfred Werner (Switzerland)
1914 T.W. Richards (England)
1915 R. Willstatter (Germany)
1916–17 No award
1918 Fritz Haber (Germany)
1919 No Award
1920 Walther Nernst (Germany)
1921 Frederic Soddy (England)
1922 F.W. Aston (England)
1923 Fritz Pregl (Australia)
1924 No Award
1925 R.A. Zsigmondy (Germany)
1926 T. Svedberg (Sweden)
1927 H. Wieland (Germany)
1928 Adolf Windaus (Germany)
1929 A. Harden (England) and H. von Euler-Chelpin (Sweden)
1930 Hans Fischer (Germany)
1931 Kal Bosch and Friedrich Bergius (Germany)
1932 Irving Langmuir (USA)
1933 No Award
1934 Harold C. Urey (USA)
1935 Frederick & Irene Joliot-Curie (France)

1936 Peter J.W. Debye (Germany)
1937 Walter N. Haworth (England) and Paul Karrer (Switzerland)
1938 R. Kuhn (Germany)—declined
1939 Adolf F.J. Butenandt (Germany)—declined—and Leopold Ruzicka (Switzerland)
1940-42 No Award
1943 G.H. De Heves (Hungary)
1944 Otto Hahn (Germany)
1945 Arturi I. Virtanen (Finland)
1946 J.B. Sumner, W.M. Stanley and J.H. Northrop (USA)
1947 Sir Roberto Robinson (England)
1948 Arne W.K. Tiselius (Sweden)
1949 William F. Giauque (USA)
1950 Otto Diels & Kurt Alder (Germany)
1951 Edward M. McMillan & Glen T. Seaborg (USA)
1952 Archer J.P. Martin & Richard L.M. Synge (England)
1953 Herman Staudinger (Germany)
1954 Linus C. Pauling (USA)
1955 Vincent du Vigneaud (USA)
1956 Sir Cyril Hinshelwood (England) Nikolai N. Semenov (USSR)
1957 Sir Alexander Todd (England)
1958 Frederick Sanger (England)
1959 Jaroslav Heyrovsky (Czechoslovakia)
1960 Williard F. Libby (USA)
1961 Melvin Calvin (USA)
1962 Max F. Perutz & .C. Kendrew (England)
1963 Kerl Ziegler (W. Germany) & Guilio Natta (Italy)
1964 Dorothy C. Hodgkin (England)
1965 Robert B. Woodward (USA)
1966 Robert S. Mulliken (USA)
1967 Manfred Eigen (East Germany), Ronald G.W. Norrish (UK) and George Porter (UK)
1968 Lars Onsager (USA)
1969 Derek H.R. Barton (England) and Odd Hassel (Norway)
1970 Luis F. Leloir (Argentina)
1971 Gerhard Herzberg (Canada)
1972 Christian B. Anfinsen, Stanford Moore & William H. Stein (USA)
1973 Ernst Otto Fischer (W. Germany), Geoffrey Wilkinson (UK)
1974 Paul J. Flory (USA)
1975 John Warcup Cornforth (Britain) Vladimir Prelog (Switzerland)
1976 William N. Lipscomb (USA)
1977 Ilya Prigogine (Belgium)
1978 Peter Mitchell (Britain)
1979 Herbert C. Brown (USA) George Witting (W. Germany)
1980 Paul Berg (USA), Walter Gilbert (USA) & Frederick Sanger (Britain)
1981 Kenichi Fukui (Japan) & Roals Hoffmann (USA)

3. Medicine and Physiology

1901 E.A. von Behring (Germany)
1902 Sir Ronald Ross (England)
1903 N.R. Finsen (Denmark)
1904 Ivan P. Pavlov (Russia)
1905 Robert Koch (Germany)
1906 S. Ramon Cajal (Spain) and Camillo Golgi (Italy)
1907 C.L.A. Laveran (France)
1908 Paul Ehrlich (Germany) & E. Metchnikoff (France)
1909 T. Kocher (Sweden)
1910 A. Kossel (Germany)
1911 A. Gullstrand (Sweden)
1912 Alexis Carrel (USA)
1913 Charles Richet (France)
1914 R. Barany (Austria)
1915-18 No Award
1919 Dr. J. Bordet (Belgium)
1920 August Krogh (Denmark)
1921 No Award
1922 A.V. Hill (England) and Otto Meyerhof (Germany)
1923 Frederic-G. Banting and J.J.R. MacLeod (Canada)
1924 W. Einthoven (Holland)
1925 No Award
1926 Johannes Fibiger (Denmark)
1927 J. Wagner-Jauregg (Austria)
1928 Charles Nicolle (France)
1929 Sir F.G. Hopkins (England) and C. Eijkman (Holland)
1930 Karl Landsteiner (USA)
1931 Otto H. Warburg (Germany)
1932 Sir C.S. Sherrington & E.D. Adrian (England)
1933 T.H. Morgan (USA)
1934 G.R. Minot, W.P. Murphy & G.H. Whipple (USA)
1935 Hans Spemann (Germany)
1936 Sir Henry H. Dale (England) and Otto Loewi (Austria)
1937 A. Szent-Dvorgyi (Hungary)
1938 C. Heymans (Belgium)
1939 G. Domagk (Germany)—declined
1940-42 No Award
1943 C.P. Henrik Dam (Denmark) and Edward A. Doisy (USA)
1944 Joseph Erlanger and Herbert Gasser (USA)
1945 Sir Alexander Fleming, Sir Howard W. Florey (England) and E.B. Chain (Germany)
1946 Herman J. Muller (USA)
1947 Carl F. and Gerty T. Cori (USA) & Bernardo A. Houssay (Argentina)
1948 Paul Mueller (Switzerland)
1949 Walter R. Hess (Switzerland) & Antonio C.A.F. Moniz (Portugal)

1950 Edward C. Kendall, Philip S. Hench (USA) & T. Reichstein (Switzerland)
1951 Max Theiler (USA-b. Africa).
1952 S.A. Waksman (USA)
1953 Hans A. Krebs (England) & Frits A. Lipmann (USA)
1954 J.F. Enders, F.C. Robbins & T.H. Weller (USA)
1955 A.H.T. Theorell (Sweden)
1956 Andre F. Cournand, D W. Richards (USA) & Dr. W. Forssmann (Germany)
1957 Daniel Bovet (Italy)
1958 G.W. Beadle, Joshua Lederberg & E.L. Tatum (USA)
1959 Severo Ochoa & Arthur Kornburg (USA)
1960 Sir M. Burnet (Australia) & Peter B. Medawar (England)
1961 George von Bekesy (USA)
1962 Francis H.C. Crick (England), Maurice H.F. Wilkins (England) and James D. Watson (USA)
1963 Sir John C. Eccles (Australia), Andrew F. Huxley, & A.L. Hodgkin (England)
1964 Konrad E. Bloch (USA) & Feodor Lynen (W. Germany)
1965 Francois Jacob, Andre Lwoff & Jacques Monod (France)
1966 Francis P. Rous & Charles B. Huggins (USA)
1967 Ranger Granit (Sweden), Haldon Keffer Hartline and George Wald (USA)
1968 Dr. Hargovind Khorana (USA) (b. India), Robert W. Holley & Marshall W. Nirenberg (USA)
1969 Dr. Max Delbruck (USA), Dr. Alfred D. Hershey (USA), Dr. Salvador Luria (USA)
1970 Sir Bernard Katz (England), Dr. Ulf von Euler (Sweden), Dr. Julis Axelrod (USA)
1971 Dr. Earl Wilbur Sutherland (USA)
1972 Gerald Edelman (USA), Rodney Porter (Britain)
1973 Karl Von Frisch (W. Germany), Zacharias Lorenz (Austria), Nicholas Tinbergen (Netherlands)
1974 Albert Claude (Luxembourg), George E. Palade (Hungary), Christian de Duve (Belgium)
1975 David Baltimore (USA), Renato Dulbecco (Britain), Howard M. Temin (USA)
1976 Baruch S. Blumberg (USA), D. Carleton Gajdusek (USA)
1977[*] Rosalyn S. Yalow (USA), Roger C. L. Gullemin (USA), Andrew V. Schally (USA)
1978 Werner Arber (Switzerland), Daniel Nathans (USA), Hamilton O. Smith (USA)
1979 Godfrey Hounsfield (Britain) Allan MCormack (USA)
1980 Buruf Benacerraf (USA), George Snell (USA), Jean Dausset (France)
1981 Roger Sperry, David Hubel (USA) & Torsten Wiesel (Sweden)

4. Literature

1901 Rene F.A. Sully-Prudhomme (France)
1902 T. Mommsen (Germany)
1903 B. Bjornson (Norway)
1904 F. Mistral (France) and Jose Echegaray (Spain)
1905 H. Sienkiewicz (Poland)
1906 Giosue Carducci (Italy)
1907 Rudyard Kipling (England)
1908 R. Eucken (Germany)
1909 Selma Lagerlof (Sweden)
1910 Paul J.L. Heyse (Germany)
1911 M. Maeterlinck (Belgium)
1912 G. Hauptmann (Germany)
1913 Rabindranath Tagore (India)
1914 No Award
1915 Romain Rolland (France)
1916 V. Heidenstam (Sweden)
1917 Karl Gjellerup and H. Pontoppidan (Denmark)
1918 No Award
1919 Carl F.G. Spitteler (Switzerland)
1920 Knut Hamsun (Norway)
1921 Anatole France (France)
1922 J. Benavente Martinez (Spain)
1923 W.B. Yeats (Ireland)
1924 L.S. Reymont (Poland)
1925 G.B. Shaw (England)
1926 Grazia Deledda (Italy)
1927 Henri Bergson (France)
1928 Sigrid Undset (Norway)
1929 Thomas Mann (Germany)
1930 Sinclair Lewis (USA)
1931 Erik A. Karlfeldt (Sweden)
1932 John Galsworthy (England)
1933 Ivan G. Bunin (USSR)
1934 Luigi Pirandello (Italy)
1935 No Award
1936 Eugene O' Neil (USA)
1937 R.M. du Gard (France)
1938 Pearl S. Buck (USA)
1939 F.E. Sillanpaa (Finland)
1940-43 No Award
1944 J.V. Jensen (Denmark)
1945 Gabriela Mistral (Chile)
1946 Hermann Hesse (Switzerland)
1947 Andre P.G. Gide (France)

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[*] Half the prize amount went to Rosalyn Yalow, who, incidentally, is the 6th woman to receive a Nobel Prize in the sciences The other half is shared equally by Roger Gullemin and Andrew Schally

1948 T.S. Eliot (England)
1949 William Faulkner (USA)
1950 Bertrand A.W. Russell (England)
1951 Par Lagerkvist (Sweden)
1952 Francois Mauriac (France)
1953 Sir Winston S. Churchill (England)
1954 Ernest Hemingway (USA)
1955 Halldor K. Laxness (Ireland)
1956 Juan R. Jiminez (Spain)
1957 Albert Camus (France)
1958 Boris L. Pasternak (USSR)
1959 Salvatore Quasimodo (Italy)
1960 Saint John Perse (France)
1961 Ivo Andric (Yugoslavia)
1962 John Steinbeck (USA)
1963 Giorgos Seferis (Greece)
1964 Jean-Paul Sartre (France)
1965 Mikhail Sholokhov (USSR)
1966 Samuel J. Agnon (Israel) & Nelly Sachs (Sweden)
1967 Miguel Angel Asturias (Guatemala)
1968 Yasunari Kawabata (Japan)
1969 Samuel Beckett (Ireland)
1970 Alexander Solzhenitsyn (USSR)
1971 Pablo Neruds (Chile)
1972 Heinrich Boell (Germany)
1973 Patrick White (Australia)
1974 Eyvind Johnson & Hary Edmund Martuson (Sweden)
1975 Eugento Montale (Italy)
1976 Saul Bellow (US)
1977 Vincente Aleixandre (Spain)
1978 Issac Bashevis Singer (USA)
1979 Odysseus Elytis (Greece)
1980 Czeslaw Milosz (Poland)
1981 Elias Canetti (Bulgaria)*

5. Peace

1901 Jean H. Dunant (Switzerland) & Frederick Passy (France)
1902 Elie Ducommun and A. Gobal (Switzerland)
1903 Sir W.R. Cremer (England)
1904 Institute of International Law (Belgium)
1905 Bertha von Suttner (Austria)
1906 L. Roosevelt (USA)
1907 E.T. Moneta (Italy) and Louis Renault (France)
1908 K.P. Amoldson (Sweden)
1909 August M.F. & A. Beernaert (Belgium)
1910 International Peace Bureau (Switzerland)
1911 T.M.C. Asser (Holland) & A.H. Fried (Austria)
1912 Elihu Root (USA)
1913 H. La Fontaine (Belgium)
1914-16 No Award
1917 International Red Cross (Geneva)
1918 No Award
1919 Woodrow Wilson (USA)
1920 Leon Bourgeois (France)
1921 K.H. Branting (Sweden) & Christian L. Lange (Norway)
1922 Fridtjof Nansen (Norway)
1923-24 No Award
1925 Charles G. Dawes (USA) & Sir J.A. Chamberlain (England)
1926 Aristide Briand (France) and G. Streseman (Germany)
1927 F. Buisson (France) and Ludwg Quidde (Germany)
1928 No Award
1929 Frank B. Kellogg (USA)
1930 Lars O. J. Soderblom (Sweden)
1931 Jane Addams and Nicholas M. Butler (USA)
1932 No Award
1933 Sir Norman Angell (England)
1934 A. Henderson (England)
1935 Carl von Ossietzky (Germany)
1936 C. de S. Lamas (Argentina)
1937 Viscount Cecil (England)
1938 Nansen International Office for Refugees (Geneva)
1939-43 No Award
1944 International Committee of Red Cross (Switzerland)
1945 Cordell Hull (USA)
1946 Emily G. Balch and John R. Mott (USA)
1947 American Friends Service Committee (USA) & Br. Society of Friends Service Council (England)
1948 No Award
1949 Lord John Boyd-Orr (England)
1950 Ralph J. Bunche (USA)
1951 Leon Jouhaux (France)
1952 Albert Schweitzer (France)
1953 George C. Marshall (USA)
1954 Office of the U.N. High Commissioner for Refugees
1955-56 No Award
1957 Lester B. Pearson (Canada)
1958 Father G. Henri Pire (Belgium)
1959 Philip J. Noel-Baker (England)
1960 A.J. Luthuli (South Africa)
1961 Dag Hammarskjold (Sweden)
1962 Linus C. Pauling (USA)
1963 International Red Cross Committee & Red Cross League (Switzerland)
1964 Dr. Martin Luther King (USA)
1965 United Nations Children's Fund
1966-67 No Award
1968 Rene Cassin (France)
1969 International Labour Organisation
1970 Norman Ernest Borlaug (USA)
1971 Willy Brandt (Germany)
1972 No Award
1973 Henry Kissinger (USA) & Le Duc Tho (Vietnam)
(Tho rejected the prize.)

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* Born in Bulgaria but living in London—writes in German.

1974 Eisaka Sato (Former P.M. Japan), Sean MacBride (Ireland), UN Commissioner for S.W. Africa, Namibia
1975 Andrie Sakharov (USSR)
1976 Betty Williams, Mairead Corrigan and Claron Mckeown (Northern Ireland)
1977 Amnesty International
1978 Anwar Sadat (Egypt) & Menacham Begin (Israel)
1979 Mother Teresa (India)
1980 Adolfo Peren Esquivel (Argentina)
1981 UN High Commissioner for Refugees

6. Economics

1969 Ragnar Frisch (Norway) & Jan Tinbergen (Holland)
1970 Dr. Paul A. Samuelson (USA)
1971 Simon Kuznets (USA)
1972 John R. Hicks (Britain) & Kenneth J. Arrow (USA)
1973 Wassily Leontief (USA)
1974 Gunnar Myrdal (Sweden) & Friedrich A von Heayek (Austria)
1975 Leonid V. Kantarovich (USSR) Tjalling C. Koopmans (USA)
1976 Milton Freidman (USA)
1977 Berti Ohlin (Sweden) & James E. Meade (England)
1978 Herbert A. Simon (USA)
1979 Theodore Shultze & Sir Arthur Lewis (USA)
1980 Lawrence Klein (USA)
1981 James Tobin (USA)

1982 Nobel Prizes

Physics

Prof. Kenneth G. Wilson of Cornell University in New York for his theory on "critical phenomena in connection with phase transitions" was awarded the prize for Physics

Chemistry

Aaron Klug, the South African-born scientist, researcher at Cambridge for his work on the crystallographic electron microscope and on important nucleic acid protein substances was awarded the prize for Chemistry.

Medicine & Physiology

Dr. Sune Bergstroem and **Dr. Bengt I. Samuelsson (Sweden)** of the Karolinska Institute, and **Dr. John R. Vane (Britain)** of the Wellcome Research Laboratories in Kent were jointly awarded the prize for Medicine.

The three shared the prize for their discoveries concerning postaglandins and related biological active substances. The institute citation said postaglandins, which make up a part of a newly discovered biological system, are formed from unsaturated fatty acids and released by the body at times of stress or illness.

Literature

Gabriel Garcia Marquez of Colombia won the Nobel Prize for Literature for 1982. The Swedish Academy cited his novels and short stories in which the fantastic and the realistic are combined in a richly composed world of imagination, reflecting a continent's life and conflicts.

Peace

Mrs. Alva Myrdal of Sweden and the former Mexican Foreign Minister **Alfonso Garcia Robles**, both disarmament campaigners, share the 1982 Nobel Peace Prize.

Economics

Prof. George Stigler of Chicago University won the 1982 Nobel prize for economics. He won the prize for "his seminal studies of industrial structures, the functioning of markets and the cause and effects of public regulation."

84. MAGSAYSAY AWARDS

The award instituted in 1957 to honour the memory of Ramon Magsaysay, the late President of the Philippines, honours 5 Asians each year who exemplify Magsaysay's "greatness of spirit, integrity and devotion to liberty" The award consists of a gold medal, a certificate and US dollars 10,000.

The awards are given for service in 5 fields: (1) Government Service, (2) Public Service, (3) Community Leadership, (4) Journalism, Literature and Communicative Arts, (5) International Understanding. The awards have been given from 1958 onwards. The names of the awardees in 1979, 1980, 1981 and 1982 are given below*.

Government Service

Year	*Name*	*Nationality*
1979	Raden Wasito	Indonesian
1980	Raja Muhammad Alias	Malaysian
1981	Dr Prawase Wasi	Thailand
1982	Arturo P. Alcarez	Filipino

Alcarez is recognised for his pioneer contribution to the development of geothermal power in the Phillipines.

Public Service

1979	Chang Kee-Ryo	Korean
1980	Ohm Dae-Sup	Korean
1981	Mrs. A.H. Nasution	Indonesian
1982	Manibhai Phimbai Desai	Indian

Desai is recognised for his contribution to rural development in and around Poona, India.

Community Leadership

1979	Rajankant S. Arole & Mabelle R Arole	Indonesian
1980	Fazle Hasan Abed	Bangladeshi
1981	Dr. Pramud Karan Sethi	Indian
1982	Chandi Prasad Bhatt	Indian

Bhatt is recognised for his services in the protection of forests in the Himalayan villages. He is the founder of the Chipko Andolan movement in which village women come forward to prevent cutting down of trees by forest contractors.

Journalism, Literature and Creative Communication

1979	L.T.P. Manjusri	Sri Lanka
1980	Francisco Sionil Jose	Filipino
1981	Gour Kishore Ghosh	Indian
1982	Arun Shourie	Indian

Arun Shourie is recognised for his incisive investigating reports on public affairs in India.

International Understanding

1979	Assn. of South East Asian Nations (ASEAN)	
1980	Shigeharu Matsumoto	Japanese
1981	Augustine Jung Ryul Kang	Korean
1982	No Award	

85. OTHER AWARDS

(i) The Nehru Award

The Nehru Award was instituted by the Government of India in honour of Pandit Jawaharlal Nehru, the first Prime Minister of India and one of the major architects of Indian freedom, who passed away in 1964. The Jawaharlal Nehru Award for International Understanding is to be given annually for outstanding contribution to the promotion of international understanding, goodwill and friendship among the peoples of the world. The award is being administered by the Indian Council for Cultural Relations.

The Award carries an amount of Rs. 100,000/- (convertible into Foreign exchange) and a Citation which is presented to the recipient at a special ceremony in New Delhi. The awardees in 1978, 1979, 1980 and 1981 are named below:†

1978	Most Ven. Nichidatsu Fuji
1979	Nelson R. Mendela
1980	Barbara Ward
1981	Gunnar Myrdal, Swedish economist and Mrs. Alva Myrdal, noted sociologist

(ii) The Kalinga Prize

The Kalinga Prize for the Popularization of Science is an international award presented each year by the United Nations Educational Scientific and Cultural Organization (UNESCO) to a person with a distinguished career of service in the interpretation of science and research to the public. Many of the winners of the Kalinga Prize have been scientists in their own right, while others have been trained in journalism or have been educators or writers. Each in his or her own way has made a significant contribution to improving public understanding of science, usually through writing, editing, public speaking, radio or television.

The Kalinga Prize was instituted by Bijou Patnaik, industrialist and politician, who is the founder and Chairman of the Kalinga Foundation Trust in the state of Orissa. UNESCO awarded the prize for the first time in 1952.

Kalinga Prize commemorates the ancient name of Orissa which was known as Kalinga in epic times. It is presented by the Director General of UNESCO and comprises an award of one thousand pounds/sterling granted by the Kalinga Foundation Trust. The winner of the prize also receives the UNESCO Gold Medal and is invited to visit India as a guest of the Kalinga Foundation Trust.

List of Awardees†

1981	A British science writer Mr. David Attenborough and Mr. Dennis

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† For previous Awardees, see Manorama Year Book 1980

Lanagan, Editor of *Scientific American* have been awarded the Kalinga Prize

1982 The 1982 Kalinga Prize for popularising science has been awarded to a Venezulean science Journalist Mr. Apristides Bastidas.

(iii) U. Thant Award

The award originally established by U. Thant and named after him since his death, is made to an outstanding Personality who through his or her efforts has contributed to the enhancement of cultural understanding and development between nations.

On August 2, 1982 Mrs. Indira Gandhi received the prestigious U Thant Award in recognition of her "outstanding and creative" contribution to East-West understanding.

The Chairman of the U Thant Awards Committee, Prof. Ralph Buuitjens, in presenting the Award of behalf of the Committee eulogised Mrs. Gandhi's interest and efforts in the field of culture and said they had inspired large numbers of people around the world to know more of their own and other cultures.

Past recipietns of the award included Dr. S. Radhakrishnan, Prof. Arnold Toynbee, Mrs. Barbara Ward, U. Nu, Mr. Lester Pearson, Mr. Adlaj Stevenson and Mrs. Nancy Wildon Ross.

(iv) Asan World Prize

The prize instituted by the Asan Memorial Committee, Kerala, commemorates Mahakavi Kumaran Asan, one of the greatest Malayalam poets of this century. The prize was instituted in 1981 and consists of a Gold Medal, a Golden Blossom and a Scroll of Honour.

List of Awardees

1981	Dr. Leopold Sedar Senghor (Senegal).
1982	Nicholas Guillen (Cuba).

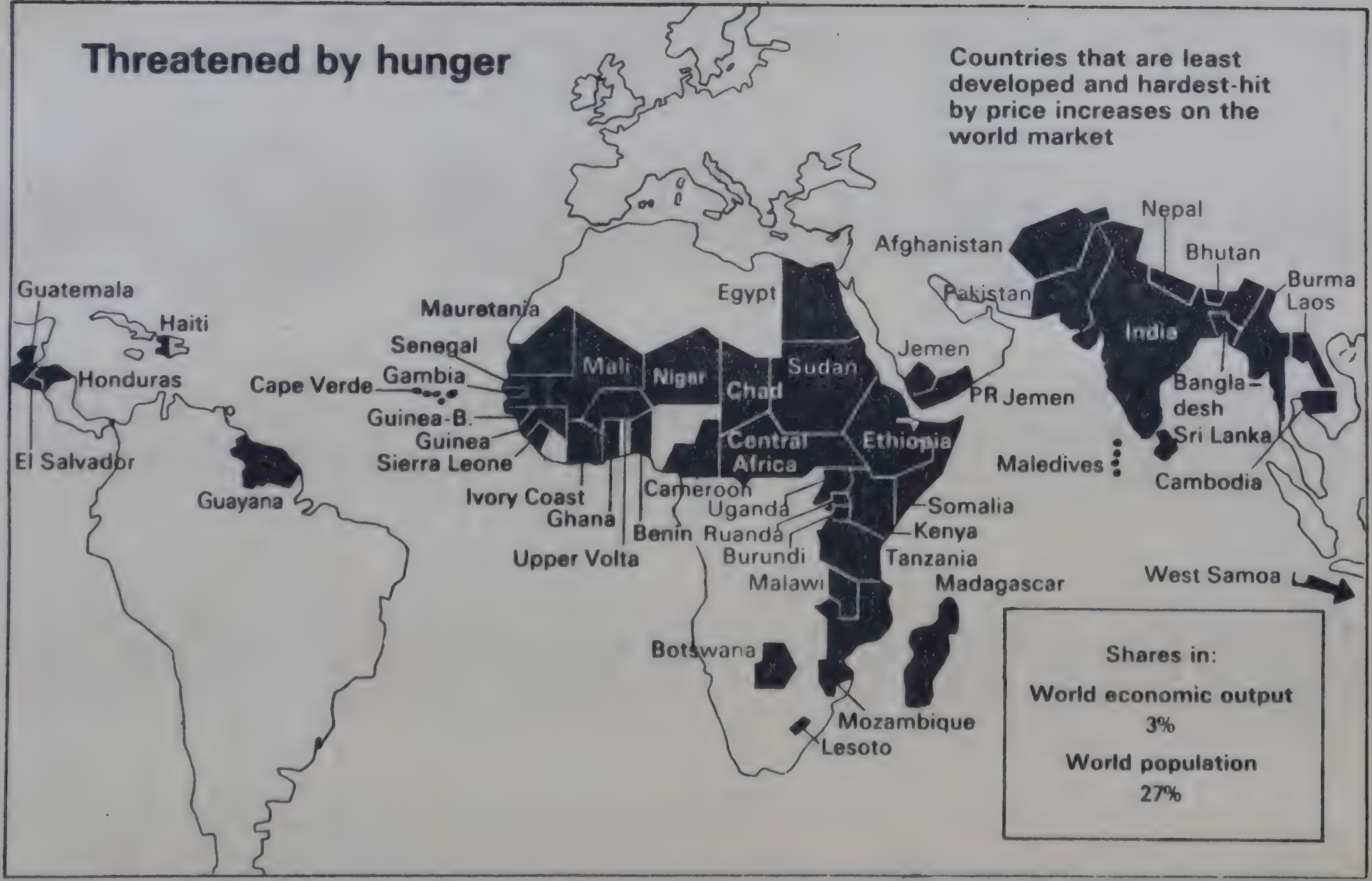
Box 34

The Third World

The Third World is an invention of our jouralists and like all journalistic inventions, more a fantasy than a fact. Then there is the North and South, another gawky invention of the newspapers. Dissecting this sort of 'journalese' is like peeling an onion. You are never wiser. So we shall content ourselves by assuming that the Third World is a world of poor nations, who have no oil to export. This lifts up Indonesia to the galaxy of the rich and drags down India into the dungeon of the poor. By no stretch of imagination, can Indonesia, be regarded as a rich country in comparison to India. India, despite its lack of oil, richer than Indonesia in more respects than one.

The Cancun Summit was a meeting of the heads of 22 states, rich and poor, on 22-23 October 1981 at Cancun, a seaside resort in Mexico. It was hosted and chaired by President Portillo of Mexico. President Reagan of USA and Prime Minister Indira Gandhi were among the distinguished heads of states present. A significant absentee was Leonid Brezhnev of Russia, who is reported to have said that the poverty of the developing nations was due to exploitation by Western powers and the Russia had nothing to do with it.

The Cancun meet agreed to launch global negotiations to rectify maladjustments and wipe out poverty. As a first step, efforts were to be intensified to end the problem of hunger in the Third World by the end of the century.



Threatened by hunger

Countries that are least developed and hardest-hit by price increases on the world market

Shares in:

World economic output
3%

World population
27%

Source: SCALA Nr. 7–8/1981.

PART III

INDIA

Final Population, India 1981

India's population was up to 685.2 million by the beginning of March, 1981, according to final figures of the 1981 census. This represents an increase of nearly 25 per cent over the 1971 census.

New Delhi, Jan. 13 (UNI)

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86. NATIONAL REGALIA

National Emblem

The State Emblem of India is an adaptation from the Sarnath Lion Capital of Asoka as preserved in the Sarnath museum. In the original there are four lions, standing back to back, mounted on an abacus with a frieze carrying sculptures in high relief of an elephant, a galloping horse, a bull and a lion separated by intervening wheels (*chakras*) over a bell-shaped lotus. Carved out of a single block of polished sandstone, the Capital is crowned by the Wheel of the Law (*Dharma Chakra*).

In the State Emblem adopted by the Government of India on 26 January 1950, only three lions are visible, the fourth being hidden from view. The wheel appears in relief in the centre of the abacus with a bull on the right and a horse on the left and the outlines of the other wheels on the extreme right and left. The bell-shaped lotus has been omitted. The words, *Satyameva jayate* from the *Mundaka Upanishad* meaning 'Truth alone triumphs', are inscribed below the abacus in Devanagari script.

National Flag

The National Flag is a horizontal tricolour of deep saffron (*Kesari*) at the top, white in the middle and dark green at the bottom in equal proportion. The ratio of the width of the Flag to its length is two to three. In the centre of the white band is a wheel, in navy blue, which represents the *Charkha.*§ *Its design is that of the wheel (Chakra*) which appears on the abacus of the Sarnath Lion Capital of Asoka. Its diameter approximates to the width of the white band. It has 24 spokes.

The design of the National Flag was adopted by the Constituent Assembly of India on 22 July, 1947. Its use and display are regulated by a code.

National Anthem

Rabindranath Tagore's song *Jana-gana-mana* was adopted by the Constituent Assembly as the National Anthem of India on 24 Jan. 1950. The 1st stanza (out of 5 stanzas) of the song forms the National Anthem. It reads:

Jana-gana-mana-adhinayaka jaya he
Bharata-bhagya-vidhata.
Punjaba-Sindhu-Gujarata-Maratha-
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchhala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gathe tava jaya-gatha.
Jana-gana-mangala-dayaka jaya he
Bharata-bhagya-vidhate
Jaya he, jaya he, jaya he,
Jaya jaya jaya jaya he.

The following is Tagore's English rendering of the stanza:

Thou art the ruler of the minds of all people, Dispenser of India's destiny.
Thy name rouses the hearts of the Punjab, Sind, Gujarat and Maratha,
Of the Dravid and Orissa and Bengal.
It echoes in the hills of the Vindhyas and Himalayas, mingles in the music of the Jamuna and Ganges and is chanted by the waves of the Indian Sea.
They pray for thy blessings and sing thy praise.
The saving of all people waits in thy hand,
Thou dispenser of India's destiny.
Victory, victory, victory to thee.

National Calendar

At the time of independence, the govt. of India followed the Gregorian calendar based on the Christian era. At the same time, a number of indigenous eras and calendars were prevalent in India, though none of them commanded all-India currency. Among them the most important were the Vikram era, the Saka era, the Bengali era and the Kollam or Malabar era. The Vikram era was the oldest, 57 years in advance of the Christian era while the Saka era was 78 years behind. The Bengali era trailed far behind at 593 years and the Kollam era was even farther behind at 824 years.

The national government adopted the recommendation of the Calendar Reform Committee that the Saka era be adopted as the basis of the National Calendar. The Saka year has the normal 365 days and begins with Chaitra as its first month. The days of the Saka calendar have a permanent correspondence with the dates of the Gregorian Calendar, Chaitra 1 falling on March 22 in a normal year and March 21 in a Leap Year The National Calendar commenced on Chaitra 1 Saka 1879 corresponding to March 22 1957 AD.

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§ *Khadi Spinning Wheel.*

The months of the National Calendar, with their days and the dates of the Gregorian Calendar corresponding to the first day of the Saka month are given below:

Table 66

Saka and Gregorian Calendars

1 Chaitra	**30 days/31 days***	**22 March/21 March***
1 Jyaistha	**31**	**21 April**
1 Asạdha	**31**	**22 May**
1 Sravana	**31**	**22 June**
1 Bhadra	**31**	**23 August**
1 Asvina	**30**	**23 September**
1 Kartika	**30**	**23 October**
1 Agrahayana	**30**	**22 November**
1 Pausa	**30**	**22 December**
1 Magha	**30**	**21 January**
1 Phalguna	**30**	**20 February**

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* *Leap Year*

87. BEG!NNINGS OF INDIAN POLITY

INDIA derived its name from the River Indus, which flowed through northwest India—now north west India and Pakistan. The first Aryan settlers in India called the River -Indus, the SINDHU, meaning a huge sheet of water. (Nowadays, the word is sometimes used as a synonym for ocean.

The Indus is a mighty river. With its five tributaries draining the Western Himalayas from Kailas to Kashmir, the Indus carries an annual flow, twice that of the Nile and three times that of the twin giants, Euphrates and Tigris combined. The Aryans in their long trek through Iran into India could never before have encountered a river of such magnitude as the Indus. That was probably why they called it the Sindhu.

In 518 B.C. Darius, the Persian Emperor, conquered the country around the Indus and converted it into a Persian satrapy. The Persians, who found it difficult to pronounce an initial 'S', turned *Sindhu* into *Hindu.* Passing through the hands of the Greeks, *Hindu* became *Indus.* India was the country of the *Indus.* With the Muslim invasions, the old Persian name returned in the form of *Hindustan* and the people who inhabited the land, came to be called *Hindus.*

Indus Civilization

The name 'India' thus harks back to the ancient Indus civilization, though no one had heard of such a civilization till the 1920s. However, in the latter half of the twenties, two ancient sites in the Indus Valley—Harappa and Mohenjo-daro—were excavated. These cities brought to light a civilization, which was at first called the Indus Valley Civilization or for short, the Indus Civilization but was specifically described later as the Harappan Civilization.

The discovery of this civilization posed a historical puzzle. It had appeared on the stage of history, full grown and fully equipped, like Athene from the head of Zeus and just as suddenly. All civilizations known to history have started from small beginnings and have taken hundreds of years to reach their prime. The Harappan civilization showed no signs of such birth and growth.

This puzzle was solved only recently with the discoveries at Mehrgarh, Baluchistan, in 1973-80. The settlements at Mehrgarh, in the western valley of the Indus, were built more than 3000 years before Mohenjo-daro and Harappa, which are situated in the eastern Indus valley. According to two researchers of Mehrgarh, Jean Francoise Jarrige and Richard H. Meadow, Mehrgarh "provides an archaeological record with a long sequence of occupations. The sequence reveals a process of continuing elaboration that affected cereal cultivation, animal husbandry, crafts, architecture and even ideology. Step by step, one can see the stage being set for the development of the complex cultural patterns that became manifest in the great cities of the Indus civilization in the middle of the third millennium BC." The cities here referred to are *Mohenjo-daro and Harappa* in Pakistan and *Kalibangan, Lothal, Sukortada* and other cities in India.

Mehrgarh

6000 B.C. — 2500 B.C.

Mehrgarh lies alongside the Bolan river at the foot of the Bolan pass. The Bolan and Khyber passes are famous in Indian history as the earliest known mountain passes through which hordes of people have crossed into India from Central Asia. "Here, the Kachi plain, a large expanse of nearly flat alluvial outwash slopes generally southeastward for more than 200 km to the Indus river."* Although Mehrgarh is administratively part of Baluchistan in Pakistan, it is hydrologically a part of the Indus system. After a flood at the beginning of this century, the Bolan river shifted its course to the west and began to flow in a new channel some kilometres away from the old one. In doing so, it cut through what has proved to be the oldest part of the ancient Mehrgarh. Research in this part has shown the existence of farming settlements belonging to that early Neolithic period, when pottery was still unknown. The most recent of a succession of mud brick structures has been shown by carbon 14 analysis to date back to the 6th millennium BC.

6000 BC. The settlement consisted of multi-room rectangular mud brick units separated from one another by open spaces that held numerous human skeletons—obviously burial grounds. Some of the structures were divided into small square compartments, apparently used for storage. Among the artifacts left are grinding stones and small flint blades. The presence of cereal grains in the mud debris indicated that two varieties of barley and three varieties of wheat were cultivated during this period. Plants other than cereals included jujuba plants and date palms. Indications are also available for the domestication of cattle, goats, sheep and water buffaloes. The water buffalo seems to have been a speciality of the Indus valley, since they are not traceable in western Asia (Middle east) around this time. Among the artifacts found buried with the dead are bead necklaces, anklets and belts. Beads were made from shell, bone, various local stones and imported turquoise and lapis lazuli. The most intriguing discovery is a single cylindrical copper bead. Does it mean that copper was first discovered by the Indus people?

5000 BC. By the fifth millennium BC, Indus Valley had entered the *chalcolithic age*. Implements of flint no doubt dominated but metal had come into use, though it was scarce. Only one copper ring and one copper bead have been uncovered at Mehrgarh during this period. Agriculture prospered embracing several new varieties of barley and wheat. A new entrant into the agricultural economy was cotton. Although it is not clear whether cotton was cultivated for its seeds or fibre, its cultivation is another unique feature of the Indus civilization. Cattle dominated animal husbandry. They were bred mainly for meat and probably also for milk. Their use as draught animals, however, is doubtful. Bead making continued, soapstone providing plenty of raw material for the purpose. Pottery advanced to red painted ware but production seems to have been limited. The commonest forms were pearshaped jars with outward curving rims.

4000 BC. The 4th millennium was an age of innovation and industrial expansion. Pottery was wheel thrown and mass produced. "Crafts became more specialised and a network of long distance contacts brought to Mehrgarh turquoise from Iran or central Asia, lapis lazuli from nothern Afghanistan and shells from the coast of the Arabian sea" * Beads of turquoise, carnelian and lapis lazuli were worked with the aid of green jasper bits which were rotated by means of bow drills. "This evidence", say Jarrige and Meadow, "for the early use of the potter's wheel and the bow drill marks Mehrgarh as a centre of technical innovation, more than 1000 years before the beginning of more elaborate craft to both east and west. We also uncovered fragments of several crucibles that had been used to melt copper. Traces of the metal still adhered to them".‡ This shows that copper had come into common use in Mehrgarh by 4000 BC. Agriculture and animal husbandry continued to expand steadily. A new genus oats was added to the crops. Cattle, goats and sheep were herded in greater numbers.

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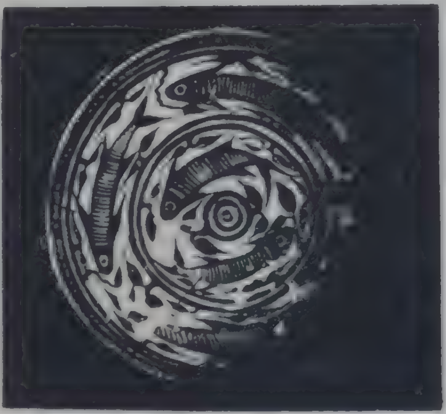
* *Jarrige & Meadow*

Fig. 1



Pottery—Shallow bowl, grayware
Mehrgarh—4th millennium BC

3500 BC. Mass produced pottery formed two major groups. There were plain wares in a variety of shapes and thickness, including egg-shell-thin goblets and painted wares displaying geometric decorations, including intricate polychrome patterns (*see Fig. 1*). Production of male and female figurines continued but statuaries of this period depicted humans in a sitting posture instead of the earlier standing posture Materials used for figurines were also used for making stamp seals.

3000 BC. By 3000 BC viticulture or wine cultivation had started in the Indus valley. Pottery had advanced to such lengths that the most rigorous standards were maintained even in large scale production.

Expansion. The third millennium was a period of great expansion (of settlements) in the Indus valley Apparently, population was pressing heavily on land and new colonies had to be founded in far off places. In the western valley, settlements radiated from Mehrgarh to eastern Iran and southern Turkmenistan on one side and to south Baluchistan on the other. In the eastern valley cities like Mohenjo-daro, Harappa, Kalibangan, Lothal and Sukortada were founded.

2500 BC. By the middle of the third millennium Indus civilization had established itself on both sides of the Indus. Many houses were two-storeyed and contained a large number of rooms. Pottery had become so refined that some of them ranked as works of art. The technique of firing had become efficient enough to attain temperatures capable of vitrifying the materials fired. (This technique is being followed even today in the areas around Mehrgarh.) Statuaries also improved. The figurines are again seen in a standing posture but they are much more naturalistic than before. Animal figures made of terra cotta include representations of the humped bovine, the *zebu*, of wild pigs and various birds. A unique find is the figure of a ram carved in alabaster. Stamp seals also carried figures of animals and other intricate designs. One bears the stylised figure of a running zebu bull. (*see Figure 2*)

2500 BC to 1500 BC

Harappan Civilization

The Harappan period belongs to the bronze age at its best and represents the high watermark of the Indus civilization. This age had at first been set between 2500 and 1500 BC. But carbon 14 analysis of materials from Kalibangan, Lothal, Sukortada and Mohenjo-daro showed that this age lasted only for 700 years—from 2400 to 1700 BC—instead of a whole millennium. Apart from the fact that Carbon 14 dating is not all that infallible, it has to be remembered that there are areas both at Mohenjo-daro and Harappa which remain to be investigated and that materials from these areas have not been subjected to carbon 14 analysis. Therefore, it is quite possible that the conventional dates 2500 to 1500 BC assigned for the Harappan period may turn out to be valid after all

The Harappan civilization which covered all cities in the eastern valley of the Indus was spread over a huge area. Prof. B. B. Lal estimates that the total area measured 1600 km east to west and 1100 km north to south.‡ This is much greater than the area jointly occupied by the contemporary civilizations of Egypt and Sumeria. This is in fact the first thing that strikes the historian in comparing the first great civilizations of history. Sumeria covered only a very small area. Egyptian civilization commanded a greater area. But their total area was much less than the area commanded by the *Indus civilization*

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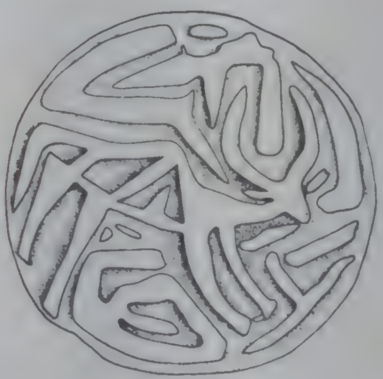
‡ Ibid.

Fig. 2



Stamp seal with stylized zebu bull
Mehrgarh—4th millennuim BC

Town Planning. Town Planning is a modern concept. It is therefore surprising that the Indus people should have practised it more than 5000 years ago. "The first thing", says Prof. Lal, "that strikes a visitor to an Indus site—be it Harappa or Mohenjo-daro in Pakistan or Kalibangan, Lothal or Sukortada in India†—is the town planning. One finds the streets and lanes laid out according to a set plan; the main streets running from north to south and the cross streets and lanes running at right angles to them. At Kalibangan, among the north-south streets, there was a principal one 7.20 metres wide, while the other north-south streets were three-quarters of its width. The cross streets and lanes were once again half or quarter of the width of the narrower streets from north to south. Such typical and minutely planned residential areas often called the 'lower towns' were themselves only a part of the entire settlement complex. For at Mohenjo-daro, Kalibangan and Sukortada there was a 'citadel' smaller in area than the lower town and invariably located to the west of it....In marked contrast might be cited the contemporary example of Ur in Mesopotamia, where there was no rigorous planning of this kind the main street wandering and curving as it wished."•

Both at Mohenjo-daro and Harappa, houses were made of kiln burn bricks. "Such bricks are rare in contemporary Mesopotamia or Egypt"°. An average house consisted of a courtyard around which were situated four to six living rooms, besides a bathroom and a kitchen. "The big houses have two or more storeys and are furnished with paved floors and courtyards, doors, windows and narrow stairways. It is specially noteworthy that almost every house has wells, drains and bathrooms"** Sullage water was discharged through well covered street drains made of kiln burnt brick. At intervals they were provided with manholes for clearance.

The citadel at Mohenjo-daro contained many imposing buildings all made of kiln burnt bricks: for example, the great bath, the college, the granary and the assembly hall. "The Great Bath is 180 ft. long and 108 ft. wide and its outer walls are about 8 ft. thick. The solidity of the construction is amply borne out by the fact that it has successfully withstood the ravages of 5000 years"‡‡

Harappa gives us some idea of the workers. "Enclosed by a boundary wall, of which only odd bits are now to be seen, the workmen's quarters stood in two rows, running from east to west. Each dwelling covering an area of about 17 by 7 metres comprised two rooms and was entered through an oblique passage, evidently so arranged for privacy. The remarkable uniformity of

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‡ A Cultural History of India-Ed. A.L. Basham.

† Mohenjo-daro, meaning 'Mound of the Dead' is in Larkana in Sind. Harappa is in Montgomery District in Punjab. Both are in Pakistan. Kalibangan is on the left bank of the now dry river Ghaggar in Rajastan. Lothal is near the Bhogavo river, not far from the Gulf of Cambay in Gujarat. Sukortada is about 270 km northwest of Ahmedabad, also in Gujarat. The last three cities are in India.

• A Cultural History of India.

° Ibid.

** Advanced History of India. R.C. Majumdar these quarters reminds one of modern barracks and all that they imply."† The granary at Harappa was situated outside the citadel, whereas in other cities the granary was inside the citadel. Comprising two blocks, the granary complex occupied an overall area of 55 by 43 metres. Each of the blocks contained six storage halls, each hall measuring 15 by 6 metres externally. As in Mohenjo-daro, air-ducts were provided underneath the floor.‡‡

Kalibangan, Sukortada and Lothal show more or less the same planning and structural patterns. Lothal, however, was a port unlike Kalibangan and Sukortada. It has a dockyard 216 metres in length and 37 metres in width. The dockyard was lined with a wall 1.2 metres thick of kiln-burnt bricks now seen rising to a maximum height of 4.3 metres. The tell-tale remains show that Lothal must have been a very busy port.

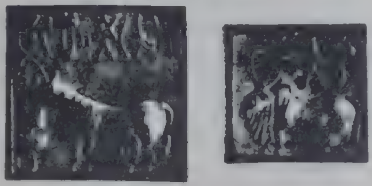
Indus pottery continued to maintain the high reputation it had earned at Mehrgarh. But patterns had changed. Familiar scenes of every day life replaced the old geometrical patterns and animal decorations. In one case, there is a she-goat suckling a kid, while a hen loiters nearby. In another, a man carries on his left shoulder an equipoise with two large nets—apparently a fisherman. A Lothal pot shows a bird perched on a tree with a fish in its beak while a fox waits below. This is reminiscent of the well known story in *Panchatantra*, where a fox seated on the ground, flatters a crow on its sweet voice and makes it sing. The fish drops from its beak and the fox promptly makes off with it.

Terra cotta figurines of humans and animals have now become fascinatingly naturalistic. So also are stone sculptures like the steatite figure of a bearded priest and the bronze image of a dancing girl both found at Mohenjo-daro.

But the most important legacy of the Indus valley are the seals. Cut out of steatite, the seals of the Harappan period are usually 20 to 30 millimetres square. (*see Figures 3 and 4*). On the obverse is an inscription, generally accompanied by an animal figure and on the reverse, a perforated knob evidently for suspension. The script seemingly pictographic and having nearly 400 signs has not yet been deciphered (see Box *Indus Script* Part II). "However, the writing appears to have been from right to left. The occurrence of inscriptions on pottery and other household goods shows that literacy was widespread and not confined to a select few.

The mastery of numbers is attested to by the system of weights and measures. Made usually of chert, and cubical in shape, the weights fall in the progression of 1, 2, 8/3, 8, 16, 32 etc. upto 12,800. The scales of ivory or shell indicate a 'foot' of about 13.0 to 13.2 inches and a 'cubit' of 20.3 to 20.8 inches" (B.B. Lal).

Fig. 3 & 4



Steatite Stamp seals
Kalibangan—3rd millennium BC

The Indus civilization was firmly based on a prosperous agricultural economy. This shows that the Indus region must have had plentiful rains during the period. "Today it is news if Mohenjo-daro gets even 10 cm of rain during the whole year. Moreover, dry channels occurring close to the (Indus) sites show that in ancient times the Indus, Ravi, Ghaggar (Saraswati of the Vedas) Satlej and Bhogavo flowed respectively on the outskirts of Mohenjo-daro, Harappa, Kalibangan, Ropar and Lothal" (Lal). Thus there was adequate water supply, which coupled with a rich alluvial soil, produced diverse crops—wheat, barley, bananas, water melons, peas and cotton.

The Harappans appear to have used a two-piece dress—a dhoti and a shawl—which is the same sort of dress that an Indian rustic wears today. The women dressed their hair in different styles and decked themselves with a variety of ornaments. "The *bija*, a hollow conical object, is typical even today of the maids of Rajasthan" (Lal)

Although little is known of the religious beliefs or practices of the

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† Advanced History of India. R.C. Majumdar

‡‡ A Cultural History of India

Harappans, many practices of modern Hindus look like a throwback to Indus culture. The portrayal on several seals of a three-faced figure, surrounded by various animals is reminiscent of Siva as *Pashupati*, Lord of Animals. The *lingam* and the *yoni* (male and femal genitals) which figure in later Hinduism apparently go back to Indus Valley. Worship of Sakti (Mother Goddess) and of trees and streams as gods or the abodes of gods also seem to have come down from the Indus days. (Also see *S. 76 Religions, Part II*).

That the Indus Valley had extensive foreign trade both by land and sea is shown by the presence of West Asian articles like animal-headed pins or mace heads in India and the corresponding presence of Indus goods in West Asian sites such as Ur, Susa, Umma, Lagesh and Tell Asmar.

What brought the Indus cities to an end is even now a matter of debate. The earliest explanation that they were destroyed by the invading Aryans does not command much support now. Floods or droughts or other natural disasters are likely explanations. But so far nothing specific has been turned up by researches that will give a satisfactory explanation of the end of the Indus civilization.

The Indus script still remains undeciphered—*pace* Dr. S. R. Rao and the Soviet experts (see Box *Indus Script* Part II) As it is, we know very little of the organisation or the administration of the Indus cities. Nevertheless, it may be assumed that the Indus Civilization was primarily a cultural and commercial empire, rather than a political organisation. The coming of the Aryans changed the entire picture. Kings and princes appeared on the scene. Empires came and went. The history of India assumed political overtones, which have survived to the present day.

88. LANDMARKS OF HISTORY

1500 BC—500 BC

The Coming of the Aryans

1500 First wave of Aryan immigration: Settlements in the Punjab: Composition of the *Rig Veda*: Beginning of the Vedic Age.

1000 Aryans expand into the valley of the Ganga: Composition of the *Brahmanas*.

900 Mahabharata War.

800 Aryans penetrate into Bengal: Composition of the *Mahabharata*: First version of *Ramayana*: Beginning of the Epic Age.

550 Composition of the *Upanishads*.

Jainism & Buddhism

544 (?) Traditional Date of Buddha's Nirvana.

527 (?) Traditional Date of Mahavira's Nirvana.

Persian & Greek Invasions

522 Accession of Darius I in Persia.

518 Darius sends Scylax on a naval expedition down the Indus: Persian conquest of north west India: Formation of a Persian Satrapy in India.

500 Aryans in the South and Ceylon.

326 Alexander invades India.

323 Death of Alexander.

321-185 Mauryan Period

321 Chandragupta unseats the Nanda dynasty in Pataliputra and founds the Maurya dynasty. Kautilya the Chief Minister of Chandragupta writes *Arthasastra* (Science of Government).

272-232 Reign of Asoka.

185 Pushyamitra, the Mauryan general, overthrows the last Mauryan Emperor Brihadratha and founds the Sanga dynasty.

Chola Empire in the South

145 Chola king Erala conquers Ceylon. Kharavela builds up an empire in Kalinga.

58 Epoch of the Krita-Malava-Vikrama era.

30 Satavahana dynasty in the Deccan. Pandyan Empire in the far South.

26 A Pandyan king sends an embassy to Rome. Chera kings in Kerala.

A. D.

40 The Sakas or Scythians in power in the Indus Valley and western India.

52 Parthian King Gondopharnes in North West India. St. Thomas begins preaching in India.

78 Saka Era begins.

98-117 Kanishka, the Scythian King.

320 Chandragupta I establishes the Gupta dynasty—Gupta Era begins.

360 Samudra Gupta conquers the whole of northern India and much of the Deccan.

380—413 Chandragupta Vikramaditya-The Golden Age of the Guptas-Literary Renaissance-Kalidasa and other poets. Renewal of Hinduism.

606 Accession of Harsha Vardhana.

609 Rise of the Chalukyas.

622 Era of the Hejira begins.

711 Invasion of Sind by Muhammad Bin Kassim.

753 Rise of the Rashtrakuta Empire.

892 Rise of the Eastern Chalukyas.

985 The Chola dynasty—Rajaraja the Great.

1026 Sack of Somnath by Mahmud of Ghazni.

1191 Prithvi Raj Chauhan, King of Delhi, routs Muhammad Ghori—the first battle of Tarain.

1192 Muhammad Ghori defeats Prithvi Raj—second battle of Tarain.

1206 Qutbuddin Aybek establishes the Slave dynasty at Delhi.

1221 Mongol invasion under Genghis Khan.

1232 Foundation of the Qutb Minar.

1288 Marco Polo visits India.

1290 Jalaludin Firuz Khilji establishes the Khilji dynasty at Delhi.

1320 Ghiyasuddin Tughluk founds the Tughluk dynasty at Delhi.

1333 Ibn Batutah arrives in India.

1336 Foundation of Vijayanagar (Deccan).

1398 Timur invades India.

1424 Rise of the Bahmani dynasty (Deccan).

1451 The Lodi dynasty. Bahlul Lodi ascends the throne of Delhi.

1489 Adil Shahi dynasty at Bijapur.

1490 Nizam Shahi dynasty at Ahmadnagar.

1498 Vasco da Gama lands at Calicut.

1510 Portuguese capture Goa—Albuquerque Governor.

1518 Kutab Shahi dynasty at Golconda.

1526 First Battle of Panipat—Babur defeats the Lodis—Establishment of the Mughal dynasty.

1530 Humayun succeeds Babur.

1538 Death of Guru Nanak.

1539 Sher Shah defeats Humayun and becomes emperor of Delhi.

1555 Humayun recovers the Delhi throne from Eslam Shah, successor of Sher Shah.

1556 Death of Humayun—Accession of Akbar. Akbar defeats Hemu at the second battle of Panipat.

1564 Akbar abolishes 'Jiziya' or poll tax on Hindus.

1565 Battle of Talikota—An alliance of Muslim rulers in Deccan defeats and destroys Vijayanagar Empire.

1571 Foundation of Fatehpur Sikri by Akbar.

1576 Battle of Haldighat. Akbar defeats Rana Pratap Singh of Mewar.

1582 Akbar proclaims *Din Ilahi* or Divine Faith—an attempt at synthesising Hinduism and Islam.

1597 Akbar completes his conquests. Death of Rana Pratap.

1600 English East India Company formed.

1602 Netherlands East India Company.

1605 Death of Akbar and the accession of Jehangir.

1609 The Dutch open a factory at Pulicat.

1611 The English establish a factory at Masulipatam.

1627 Death of Jehangir—Accession of Shah Jehan—Birth of Shivaji

1631 Death of Shah Jehan's wife Mumtaz Mahal—The building of the Taj Mahal.

1639 Foundation of Fort St. George at Madras by the English.

1658 Aurangzeb becomes emperor of Delhi.

1664 Shivaji assumes royal title.

1679 Aurangzeb re-imposes Jiziya.

1707 Death of Aùrangzeb.

1720 Accession of Baji Rao Peshwa at Poona.

1739 Nadir Shah of Persia conquers Delhi.

1742 Mahratas invade Bengal—Dupleix, French Governor of Pondicherry.

1748 First Anglo-French war.

1757 Battle of Plassey—The English defeat Siraja Daulah—Mir Jafar, Nawab of Bengal.

1760 Battle of Wandiwash—The English defeat the French.

1761 Third Battle of Panipat—Ahmed Shah Abdali, the ruler of Afghanistan, defeats the Mahratas—Mahrata imperialism checked.

1764 Battle of Buxar—the English defeat Mir Kasim.

1765 The English get Diwani Rights in Bengal, Bihar and Orissa—Clive, Governor in Bengal.

1766 The English secure Northern Circars in the Carnatic.

1767-69 First Mysore war—the British conclude a humiliating peace with Hyder Ali of Mysore.

1772 Warren Hastings, Governor of Bengal.

1773 The Regulating Act passed by the British Parliament.

1775-82 First Anglo-Mahrata war. The Treaty of Salbai.

1780-84 The Second Mysore War. The English defeat Hyder Ali.

1784 Pitt's India Act.

1790-92 Third Mysore War between the English and Tipu—An indecisive war concluded by the Treaty of Seringapatam.

1793 Permanent Settlement of Bengal.

1798 Marquess of Wellesley becomes Governor General of India.

1799 Fourth Mysore War—The English defeat Tipu—Death of Tipu—Partition of Mysore

1801 The English annex the Carnatic.

1803-5 Second Anglo-Mahrata War. British under Sir Arthur Wellesley inflict a crushing defeat on the Mahratas at Assaye.

1817-19 Mahratas finally crushed by British forces.

1828 Lord William Bentick becomes Governor General—Era of scoial reforms—Prohibition of Sati (1829). Suppression of Thugs (1837).

1831 Rise of the Sikhs under Ranjit Singh.

1845-46 First Anglo-Sikh War—Defeat of the Sikhs.

1848 Lord Dalhousie becomes Governor General.

1848-49 Second Anglo-Sikh War—Sikhs defeated in battle (1848). The British annex Punjab.

1853 First Indian Railway opened from Bombay to Thana.

1857-58 First War of Indian Independence.

1858 British Crown takes over the Indian Government—Queen Victoria's Proclamation.

1861 Indian Councils Act—Indian High Courts Act—Indian Penal Code.

1868 Railway opened from Ambala to Delhi.

1877 Delhi Durbar—The Queen of England proclaimed Empress of India.

1878 Vernacular Press Act.

1881 Factory Act—Rendition of Mysore—Mysore State restored to its original ruler.

1885 First meeting of the Indian National Congress.

1892 Indian Councils Act to regulate Indian administration.

1899 Lord Curzon becomes Governor General and Viceroy.

1905 First partition of Bengal.

1906 Formation of the Muslim League.

1908 Newspapers Act.

1909 Minto-Morley Reforms.

1911 King George V and Queen Mary hold a Durbar in Delhi. Partition of Bengal modified to create the Presidency of Bengal. The imperial capital shifted from

Calcutta to Delhi

1914 The First World War begins.

1915 Defence of India Act.

1918 World War ends.

1919 Rowlatt Act intended to perpetuate the extraordinary powers enjoyed by the government during the war provoke country-wide protests. The Massacre at Jalianwallabhag. Ali brothers and Maulana Abul Kalam Azad start the Khilafat movement (for restoring the Turkish Khalifate) with Gandhiji's support. Perfect Hindu-Muslim accord. Montague-Chelmsford Reforms offer limited provincial autonomy to Indians.

1920 Congress okays non-cooperation movement. Students leave colleges, lawyers leave practice. Bonfire of British clothes etc. to show popular dissatisfaction with the reforms.

1921 Moplah (Muslim) rebellion in Malabar. Visit of the Prince of Wales. Nation-wide hartal. Census of India.

1922 Civil Disobedience Movement. Congress makes Gandhiji sole leader of Bardoli satyagraha. Outburst of violence at Chauri Chaura. Gandhiji suspends movement on this account.

1923 Swarajya party started by C. R. Das and Motilal Nehru. Swarajists propose to enter the Councils and wreck the government from within. Khilafat movement fizzles out as Kemal Pasha declares Turkey a secular state. Hindu-Muslim riots.

1925 Death of C. R. Das.

1926 Lord Reading expounds to the Nizam what paramountcy implies. Royal Commission on Agriculture. Factories Act.

1927 Indian Navy Act. Simon Commission appointed.

1928 Simon Commission comes to India. Boycott by all parties. All Parties' Conference. Muslim leaders leave the Conference.

1929 Lord Irwin, Viceroy of India, promises Dominion Status for India. Lahore Session of the Congress asks for independence. On the midnight of Dec. 31, Pandit Jawaharlal Nehru, President of the Congress, hoists the National Flag at Lahore.

1930 Jan. 26 observed as Independence Day all over India. Civil Disobedience Movement continues. Gandhiji goes walking to Dandi—Salt Satyagraha. Repression let loose by the government. First Round Table Conference.

1931 Gandhi-Irwin Pact. Second Round Table Conference. Census of India.

1932 Suppression of Congress movement. Third Round Table Conference. The Communal Award. Poona Pact.

1933 White Paper on Indian reforms.

1934 Civil Disobedience Movement called off.

1935 Government of India Act.

1936 Death of King George V. Accession and abdication of Edward VIII. Accession of George VI.

1937 Inauguration of Provincial Autonomy. Congress Ministries formed in a majority of the provinces.

1939 Second World War begins. Resignation of Congress Ministries. Political deadlock in India.

1941 Japan enters the war. Attack on Pearl Harbour.

1942 Singapore falls to Japan. Japan occupies Rangoon. The British evacuate Burma. Cripps Mission to India. Both Congress and Muslim League refuse Cripps offer. Congress adopts Quit India Resolution (Aug. 8). Congress leaders arrested and Congress declared an illegal body (Aug. 9). Subash Chandra Bose (Netaji) forms the Indian National Army in Malaya, with the help of the Japanese. He inaugurates Government of Free India at Singapore.

1943 Lord Wavell Viceroy and Governor General of India. Wavell's proposals for a settlement fall through as the Congress and the Muslim League could not agree.

1945 The Indian National Army under

Bose surrenders to the British after collapse of Japan. National Army personnel tried for treason in India.

1946 Demonetisation of currency notes of the value of Rs. 500 and above (Jan. 12). Demonstrations against the trial of the INA men. The ratings of the Royal Indian Navy rise in open mutiny (Feb. 18). Cabinet Mission in India (Aug. 19). Cabinet Mission announces its plan for an interim government and a constituent assembly. The interim government is to be formed by reconstituting Viceroy's Executive Council. Both Congress and the Muslim League reject the proposal. Later the Congress accepts it. So the interim government is formed by inducting Congress nominees only. The Muslim League takes umbrage and starts direct action. Muslims attack Hindus in Calcutta and the rest of Bengal. Hindus retaliate. Riots break out. Viceroy persuades the Muslim League to come in. But the League declines to join the Constituent Assembly unless the demand for a separate state—Pakistan—is conceded.

89. FREEDOM AND AFTER

1947 British government announces its intention to quit India by June 1948 **(Feb. 20)**. Lord Mountbatten named Viceroy to arrange the transfer of power. Muslims resort to direct action once again and riots break out in Punjab and the north west. Mountbatten assumes charge **(March 24)**. He concedes the demand for Pakistan and broadcasts his plan for a partition of India. British parliament passes the India Independence Act **(July 1)** and fixes Aug. 15 for the transfer of power. Partition of India into India & Pakistan. Power transferred to India and Pakistan. Lord Mountbatten becomes Governor General of India and M.A.Jinnah, Governor General of Pakistan **(Aug. 15)**.

1948 Assassination of Mahatma Gandhi **(Jan. 30)**. Death of M.A.Jinnah **(Sept. 11)**. The Government of India occupies the Nizam's dominions (Hyderabad State).

1949 Constitution of India adopted by the Constituent Assembly **(Nov. 26)**.

1950 Constitution of India comes into force **(Jan. 26)**. Sardar Patel dies **(Dec. 15)**.

1951 The First General Election in India. First Amendment to the Constitution.

1952 Dr. Rajendra Prasad elected Rashtrapathi (Head of State). Second Amendment.

1954 Panch Sheel agreement between China and India. Third Amendment.

1955 Avadi Session of the Indian National Congress adopts a socialistic pattern of society for India. 4th and 5th Amendments.

1956 Life Insurance nationalised. 6th and 7th Amendments. States Reorganisation Act.

1957 Second General Election. Rajendra Prasad re-elected for a second term

1958 Metric system of weights and measures introduced.

1959 Swatantra Party formed. 8th Amendment

1960 Bombay bifurcated into Maharashtra and Gujarat States. 9th Amendment.

1961 India occupies the Portuguese enclaves of Goa, Daman and Diu. 10th and 11th Amendments.

1962 Third General Election in India. Dr. Radhakrishnan elected President. Nehru forms the third Congress ministry. China attacks India on the northern border **(Sept. 19)**. 12th, 13th and 14th Amendments.

1963 Gold Control Order. Rajendra Prasad dies **(Feb. 28)**. Nagaland becomes a state of the Indian Union. Union Territory of Goa forms its own cabinet and legislature. 15th and 16th Amendments.

1964 Pandit Nehru, Prime Minister of India, dies **(May 27th)**. Lal Bahadur Sastri becomes P.M. Communist Party of India splits into right and left—Communist Party of India (CPI) and Communist Party of India—Marxist (CPM). 17th Amendment.

1965 Indo-Pakistan war in the Rann of Kutch. Cease-fire in the Rann **(June 30)**.

1966 Tashkent meeting between Lal Bahadur Sastri and Ayub Khan. Agreement reached. Sastri dies at Tashkent **(Jan. 11)**. Indira Gandhi elected Prime Minister **(Jan. 19)**. Dr. Bhabha dies in a plane accident. C. P. Ramaswamy Iyer dies **(July 26)**. The States of Haryana and Punjab come into being. 18th, 19th & 20th Amendments.

1967 Opinion Poll in Goa. Goa decides to continue as Union Territory. Fourth General Election. Indira Gandhi elected Prime Minister. Dr. Zakir Hussain elected President. Earthquake at Koyna (Maharashtra). 21st Amendment.

1969 Madras State changes its name to Tamil Nadu. Zakir Hussain dies **(May 3)**. V. V. Giri becomes Acting President. Nationalisation of 14 leading banks by Presidential Ordinance **(July 19)**. Giri resigns Acting Presidentship to contest the Presidential election. Chief Justice Hidayattulla takes charge as Acting President. Giri elected President **(Aug. 20)**. G. S. Pathak Vice President. Cong. Party splits. Indira Gandhi forms her own Congress party. Jagjivan Ram President of the Indira Congress. 22nd & 23rd Amendments.

1970 Supreme Court holds nationalisation of banks illegal. Presidential ordinance revalidates nationalisation **(Feb. 14)**. West Bengal Ministry resigns. President takes over the government of West Bengal. State of Meghalaya comes into being **(April 2)**. Kerala Ministry under Achuta Menon resigns. President takes over the government. Privy purses and special privileges of former Indian rulers abolished by Lok Sabha. Uttar Pradesh ministry dismissed. President takes over the government. Dr. C. V. Raman dies **(Nov. 21)**. Supreme Court strikes down the Presidential order (in terms of the Lok Sabha resolution) abolishing privy purses and special rights to princes. President dissolves the Lok Sabha.

1971 President takes over the government in Orissa. Himachal Pradesh becomes a State **(Jan. 25)**. K. M. Munshi dies **(Feb. 8)**. Indira Congress wins the mid-term elections for Lok Sabha. Indira Gandhi becomes P.M. General Insurance nationalised **(May 13)**. President takes over administration in Punjab. Nationalisation of 214 coal mines in West Bengal and Bihar. Presidential government in Tripura. Indo-Pakistan war begins. Pakistan attacks India in the west **(Dec. 3)**. India recognises Bangladesh. Indian army marches into Bangladesh, joins hands with Mukhti Bahini of Bangladesh. Pakistan army in Bangaladesh surrenders to the Indian Commander. Indo-Pak war ends **(Dec. 17)**. 24th, 25th, 26th and 27th Amendments.

1972 Presidential government in Bihar. Manipur, Meghalaya and Tripura becomes states of the Indian Union. Arunachal Pradesh and Mizoram become Union Territories **(Jan. 20)**. Presidential government in Manipur and Tripura. Elections to State Assemblies (March). Dacoits of Madhya Pradesh surrender to Jaya Prakash Narain **(April)**. Government of India announces increase of minimum bonus to workers from 4% to 8.33% **(Sept. 18)**. Mulki agitation in Andhra Pradesh. P.M. announces in Parliament that Mulki rights (for preference in appointments) will continue for a limited period C. Rajagopalachari dies **(Dec. 28)**. 28th, 29th and 30th Amendments

1973 President takes over the government in AP. President dissolves the Orissa legislature and takes over the government. President dissolves the Manipur Assembly and takes over the government. Supreme Court endorses the right of the Parliament to amend any part of the constitution, including Fundamental Rights. Justice Ajit Nath Ray named Chief Justice of the Supreme Court, superseding the three seniormost judges—J. M. Shelat, K. S. Hegde and A. N. Grover. Justices Shelat, Hegde and Grover resign in protest. Mohan Kumaramangalam, Central Minister, dies in an air crash near Delhi **(May 31)**. President suspends the UP Assembly and takes over the government. Prime Minister's 6-point plan for Andhra Pradesh settles the Mulki question. The Sixth Finance Commission submits its report **(Oct. 28)**. Mysore changes its name to Karnataka **(Nov. 1)**. E. V. Ramaswamy Naicker (EVR), founder of the Dravida Kazhakam, dies **(Nov. 24)**. 31st and 32nd Amendments.

1974 President takes over the administration of Pondicherry **(Jan. 3)**. President suspends the Assembly and takes over the administration of Gujarat **(Feb. 9)**. General Elections in Orissa, UP, Manipur and Pondicherry. Jaya Prakash Narain starts 'Citizens for Democracy' movement for cleansing the administration and strengthening democracy. Atomic 'device' exploded at Pokran in Rajasthan **(May 18)**. J. P. Narain leads an agitation for dissolution of the Bihar Assembly. India and Sri Lanka agree on the administration of Kachidweep (island) in Palk Straits. Sri Lanka is to have exclusive jurisdiction over the island **(June 27)**. Compulsory Deposit Scheme announced **(July 17)**. Fakhruddin Ahmed Ali elected President **(Aug. 20)**. B. D. Jatti Vice-President. J.P. leads a popular morcha to the Bihar Legislature. The agitators lathi-charged. J.P. suffers injuries. Bihar Bandh complete. State-wide hartal observed. Presidential ordinance prohibiting the courts from taking cognisance of detentions under MISA. Sucheta Kripalani dies **(Dec. 1)**. Restoration of diplomatic ties between India and Portugal. 33rd, 34th and 35th Amendments.

1975 L. N. Mishra, Railway Minister, and 22 others hurt in bomb blast at Samastipur Railway Station. L. N. Mishra dead **(Jan. 2)**. India accords recognition to the Palestine Liberation Organisation (10). Oil struck in third Bombay High well (11). Thirty-six killed in earthquake in Kinnaur Lahaul-Spiti in HP (20). Silver Jubilee of the Indian Republic (26). West Indies wins the Fifth Cricket test against India and wrests Rubber (29). US informs India of decision to arm Pakistan **(Feb. 23)**. Sheikh Abdullah becomes Jammu and Kashmir Chief Minister (24). 'People's March' to Parliament. J.P. presents charter to presiding officers of Parliament, announces marches elsewhere in the country. J.P. leads 'People's Morcha' to Bihar Vidhan Sabha **(March 18)**. India recognises Sihanouk Government in Cambodia **(April 1)**. Sikkim Congress wants statehood for Sikkim. The Sikkim Assembly asks for abolition of the institution of Chogyal and for full statehood. Tul Mohan Ram and two others charge-sheeted in the Pondy Licence Scandal Case (14). Sikkim, in referendum, votes for full statehood in India, for abolition of the institution of Chogyal (15). Dr. S. Radhakrishnan, former President, dies **(Apr.17)**. India ushered into space age; satellite 'Aryabhatta' launched from a cosmodrome in Soviet Union (19). Lok Sabha passes Sikkim Bill (23). Sikkim joins Indian Union as the 22nd State **(May 16)**. Oil found in the fifth Bombay High well (20). Farakka Barrage dedicated to nation (21). Mrs. Indira Gandhi's election set aside by Allahabad High Court **(June 12)**. Justice V. R. Krishna Aiyar of the Supreme Court gives conditional stay of the Allahabad High Court judgement (24). Opposition leaders announce nationwide Satyagraha from June 29 to force Mrs. Gandhi out of office. President declares emergency. J.P. and a number of Opposition leaders and dissident Congressmen arrested (26). Presidential Order bars arrested persons from seeking relief from courts. Emergency committee of the Union Cabinet formed with Mrs. Gandhi, Jagjivan Ram, Y. B. Chavan, H. R. Gokhale, K. Brahmananda Reddy and Om Metha (27). Prime Minister announces 20-point economic programme. New Ordinances promulgated **(July 1)**. The RSS, Anand Marg, Jamat-i-Islam and 23 other organisations banned. Parliament approves Conservation of Foreign Exchange and Prevention of Smuggling Activities Act (COFEPOSA). Parliament approves MISA bill.

Lok Sabha adopts Election Laws (Amendment) Bill seeking to remove retrospectively certain 'uncertainties and doubts' regarding some provisions of the Representation of the People Act **(Aug. 5)**. Constitution (39th Amendment) Bill 1975, placing election of President, Vice President, PM and Lok Sabha Speaker beyond the scrutiny of judiciary, approved by Parliament. Rajya Sabha adopts Constitution (41st Amendment) Bill extending immunity from criminal and civil proceedings to the Prime Minister. Calcutta enters TV era. Madras comes on TV map of India. Ordinance promulgated for grant of national permits for goods trucks **(Sept. 26)**. Government announces 12-point programme for making Prohibition policy a success **(Oct. 1)**. K. Kamaraj dead (2). New MISA Ordinance prevents courts from enquiring into the grounds for detention of persons (17). 'Bonded' labour abolished by Ordinance (24). P.M's election upheld by the Supreme Court **(Nov. 7)**. Naga problem settled. Jayaprakash Narayan released on parole (11). Re-detention authorised by a new Ordinance amending MISA (16). Government of India and Burmah-Shell sign agreement for take-over of oil company's marketing and refining operations in India (26). President's rule imposed in Uttar Pradesh (30). Detention order on J.P. revoked and J.P. set free **(Dec. 4)**. Government assumes special powers to prevent publication of objectionable matter in the press, repeals immunity for press reports of Parliament and abolishes Press Council from New Year day (Jan. 1, 1976). A large number of miners trapped in Dhanbad (Bihar) colliery (27). 75th Plenary Session of the Congress opens at Chandigarh: D. K. Barooah elected Congress President (29). 36th, 37th, 38th and 39th Amendments.

1976 Baliram Bhagat elected Lok Sabha Speaker **(Jan. 6)**. President suspends seven freedoms guaranteed by Article 19 (8). President's Rule ends in Uttar Pradesh. Burma Shell, nationalised, becomes Bharat Refineries Limited (24). Lok Sabha passes Prevention of Objectionable Matters Publications Bill. President's rule in Tamil Nadu. India's national news agency "Samachar" launched **(Feb. 1)**. Lok Sabha's life extended by one year (4). Urban Ceilings Act comes into force (17). Gujarat comes under President's rule **(March 13)**. India and Pakistan agree to exchange envoys, and resume overflights, restore air and rail links **(May 14)**. Commercial oil flows from Bombay High (21). Lok Sabha passes 40th Constitutional Amendment placing 64 Central and States laws above court review (25). IA Boeing 737 to Bombay via Jaipur hijacked to Lahore, passengers released on **September 11**. 89 killed in I.A. plane crash at Bombay airport **(Oct. 12)**. Lok Sabha passes the 42nd Constitution Amendment Bill making India a Socialist Secular Republic and laying down fundamental duties for citizens **(Nov. 2)**. Lok Sabha votes to extend its own life by another year (5). Cyclone causes heavy damage in Madras and A.P. (25). Maharashtra Governor Ali Yavar Jung dies. President's rule in Orissa proclaimed **(Dec. 16)**. England beats India in New Delhi Cricket Test (22). President's Rule lifted in Gujarat (24). 40th, 41st & 42nd Amendments.

1977 The President dissolves Lok Sabha on the advice of the Prime Minister, Mrs. Indira Gandhi **(Jan. 18)**. Government relaxes rules of Emergency to permit normal political activity and electioneering and decides not to enforce press censorship. Four parties—Congress (O), Jan Sangh, Bharatiya Lok Dal and the Socialist Party—agree to work as one party under the name Janata Party. An ordinance amending the Representation of People Act, 1951, promulgated with immediate effect increasing the period of disqualification of persons convicted for any offence from five years to six years. Two ordinances providing for the setting up of two authorities, one to decide disputes about election of the President and the Vice-President and the other about the Prime Minister and Speaker promulgated **(Feb. 3)**. The President issues notification calling upon all parliamentary constituencies to elect 542 members to the new Lok Sabha (10). President Fakhruddin Ali Ahmed passes away in New Delhi. B. D. Jatti sworn in Acting President (11). India's second earth station for satellite communication at Dehra Dun inaugurated (25). Hasan-Mangalore railway line commissioned in Karnataka (27). Polling in the Lok Sabha election starts **(Mar. 16)**. Internal Emergency promulgated on June 25, 1975 withdrawn (21). Press censorship goes. Janata and its allies gain absolute majority in Lok Sabha. Mrs. Indira Gandhi resigns (22). Ban on RSS and 26 other organisations lifted. A. K. Gopalan, Marxist leader, dies in Trivandrum. The RSS chief Deoras released. Morarji Desai elected Leader of Janata Party and sworn in Prime Minister (24). Sixth Lok Sabha session begins (25). Sanjiva Reddy elected Speaker of the Lok Sabha. Government revokes the external emergency promulgated on December 3, 1971. Governor's rule in Jammu and Kashmir. State Assembly dissolved (27). Ministry of Health and Family Planning redesignated as Ministry of Health and Family Welfare **(April 12)**. Goa Assembly dissolved (27). The Acting President B. D. Jatti dissolves the Legislative Assemblies of nine Congress-ruled States, Bihar, Haryana, Himachal Pradesh, M. Pradesh, Orissa, Punjab, Rajasthan, Uttar Pradesh and West Bengal and places them under President's rule. Four Parties—Congress (O) (Old Congress as distinguished from Indira Congress), Jan Sangh, Bharatiya Lok Dal and Socialist Party—at their separate sessions decide to dissolve themselves and merge into a single party (30). The Janata Party formally launched at its inaugural convention at Pragati Maidan, New Delhi. Chandra Shekar chosen President of the Janata Party **(May 5)**. K. Brahmananda Reddi elected President of the Indian National Congress. The Election Commission recognises the Janata Party as a National Party. Poll notifications for ten States and two Union Territories issued by the respective Governors and Lieutenant Governors. Thirteen Harijans burnt alive by an armed gang in Belchhi village in Patna district **(June 3)**. Janata gains absolute majority in Haryana, Himachal Pradesh and Rajasthan Assemblies and in Delhi Metropolitan Council. Akali-Janata-CPM alliance wins absolute majority in Punjab. Janata gets absolute majority in Uttar Pradesh, Madhya Pradesh and Orissa. The All-India Anna DMK gets absolute majority in Tamil Nadu. No party gets absolute majority in Pondicherry. Janata gains absolute majority in Bihar. CPM in absolute majority in West Bengal. Government decides to discontinue national civilian awards **(July 10)**. N. Sanjiva Reddi elected (unopposed) President of India. K. S. Hegde unanimously elected Lok Sabha Speaker (21). The Planning Commission decides to introduce Rolling Plan concept **(Sept. 10)**. Variable energy cyclotron commissioned in Calcutta (15). Mrs. Indira Gandhi arrested in New Delhi by the CBI on charges of corruption. Mrs. Indira Gandhi released unconditionally. The External Affairs Minister A. B. Vajpayee addresses UN General Assembly in Hindi, the first ever. A new off-shore oil stratum discovered by the ONGC, 75 km south west of Bombay. India and Bangladesh formally sign Farakka agreement in Dacca. Tripura comes under President's rule **(Nov. 5)**. Cyclone hits coastal Andhra Pradesh (19). The silver jubilee time capsule in the Red Fort dug out **(Dec. 8)**. 43rd Amendment.

1978 Air-India Boeing 747 with 213 persons aboard crashes into the sea off Bombay coast. **(Jan. 1)**. "M.V. Chandragupta", bulk carrier of the Shipping Corporation of India, with 69 persons aboard sinks in the Pacific Ocean (6). A Minorities Commission is constituted (15). Currency notes of the denominations of Rs. 1000, Rs. 5000 and Rs. 10,000 are demonetised (16). The Indian National Congress (I) is recognised as a national party and alloted the election symbol "hand". Malayalam poet Mahakavi G. Sankara Kurup dies in Trivandrum **(Feb. 2)**. Justice Y. V. Chandrachud is sworn in as Chief Justice of India. Swaran Singh is elected Congress President **(Mar. 1)**. The Shah Commission's interim report is submitted to the Government. K. D. Singh "Babu", Indian hockey ace, dies in Lucknow (27). The Government decides to abolish preventive detention (30). The Congress (I) is recognised as the main Opposition and its leader, C. M. Stephen, as leader of the Opposition in the Lok Sabha **(April 12)**. Samachar splits and its four constituents—PTI, UNI Samachar Bharati and Hindustan Samachar—start functioning separately (14). Suresh Goel, former national badminton champion, dies in Varanasi (19). The Jnanpith Award for 1976 is presented to Mrs. Ashapurna Devi for the Bengali novel *Prathama Pratishruti* (26). India accords recognition to the new regime in Afghanistan **(May 1)**. A second Press Commission is announced (14). Prime Minister Morarji Desai addresses the special session of the UN General Assembly on disarmament. Oil from Bombay High starts flowing **(June 13)**. The Karakoram Highway, linking Gilgit in Pakistan-occupied Kashmir with Sinkiang in China, is opened (18). India, Indonesia and Thailand sign in New Delhi a trilateral agreement settling permanently the limits of the seabed areas in the Andaman Sea within which the three countries will exercise sovereign rights (22). The Patna High Court sets aside the sessions court judgement sentencing the founder-head of the Ananda Marg, P. R. Sarkar, alias Anandamurti and four others to imprisonment for life **(July 4)**.

Mother Teresa is presented with the Order of the British Empire for her services to humanity, at a ceremony in New Delhi. Justice H. R. A. Ansari is appointed chairman of the reconstituted Minorities Commission (26). The Rajya Sabha passes the MISA Repeal Bill (27). Vinoo Mankad, cricketer, dies in Bombay **(Aug. 21)**. A statutory minimum bonus of 8.33 per cent for workers for the accounting year 1977, regardless of profit, is announced (22). The Shah Commission's final report and the memorandum of action taken on it is presented to Parliament. The Rajya Sabha returns the Constitution (45th Amendment) Bill to the Lok Sabha after striking down five clauses (31). An ordinance is promulgated for the minimum bonus of 8.33 per cent to industrial workers for the accounting year 1977 **(Sept. 8)**. Valerian Cardinal Gracias, Archbishop of Bombay, dies (11). A test-tube baby, world's second, is claimed born in Calcutta **(Oct. 3)**. India is unanimously elected Chairman of the UN Disarmament Commission. External Affairs Minister A. B. Vajpayee addresses the UN General Assembly (10). The report of the Jagan Mohan Reddy Commission, on the Nagarwala case, is submitted to the Government (23). Maximum emoluments payable to senior executives in public limited companies in the private sector are curtailed (26). Seventh Finance Commission's report presented (28). An IAF plane crashes at Leh killing 77 defence personnel and a civilian **(Nov. 19)**. The Privileges Committee of the Lok Sabha holds Mrs. Indira Gandhi guilty of breach of privilege and contempt of the Lok Sabha for obstructing Government officials from collecting information for a question on Maruti in 1975 (21). The Government accepts the recommendations of the Seventh Finance Commission (24). The Supreme Court declares the Parliament has the legislative competence to create special courts to try cases involving emergency offences **(Dec. 1)**. An Indian Airlines Boeing 737 crashlands near Hyderabad airport (17). The Lok Sabha expels Mrs. Indira Gandhi, former Prime Minister, from the House and sentences her to imprisonment for a term to last until its prorogation (19) Gas is struck off the shore, 120 km northwest of Bombay (21). Mrs. Indira Gandhi is released from jail (26). 44th Amendment.

1979 Excise duty on khandsari abolished **(Jan. 1)**. Rohini-200, first monsoon experimental rocket, launched from Thumba (6). Kanpur TV centre commissioned (12). Jnanpith award to S. H. Vatsyayan, Hindi poet and novelist (20). World Sanskrit Conference in Allahabad. The Election Commission declares the Chickmagalur seat in Lok Sabha vacant following the expulsion of Mrs. Indira Gandhi (30). The Cellular jail in Andaman and Nicobar declared a national memorial **(Feb. 11)**. Sanjay Gandhi and the former Information and Broadcasting minister V.V. Shukla sentenced to two years in jail for the destruction of the film "Kissa Kursi Ka" (27). Mr. Jairamdas Daulatram dies **(Mar. 1)**.

Jullundur T.V. centre commissioned **(April 13)**. Goa, Diu and Daman under President's rule (28). K. P. S. Menon gets Lenin prize **(May 1)**. Cyclone hits coastal Andhra Pradesh—widespread damage to life and property (12). Gupta commission indicts Sanjay Gandhi and others on irregular Maruti deals (31). Soviets launch India's second satellite "Bhaskara" **(June 3)**. Cases filed in special courts against Mrs. Gandhi, Mr. V. C. Shukla and others for harassment of officials investigating Maruti deals and for using government artists to design election posters (12). Jeep scandal case against Mrs. Gandhi and others filed in special courts (13). The Congress (I) loses main opposition status in the Lok Sabha to the Congress(U). The Congress tables no-confidence motion against the Janata government **(July 11)**. Mr. Morarji Desai resigns as prime minister (15). Jagjivan Ram elected Janata parliamentary party leader after Morarji Desai resigns on the exposure of false claim of support. Charan Singh is prime minister heading Janata (S)-Congress coalition and Mr. Jagjivan Ram is leader of the opposition in the Lok Sabha (17). New ministry of rural reconstruction formed (19). M.V. Kairali, the only ship of the Kerala State Shipping Corporation, disappears in Gulf waters. The crew of 51 missing (20). Mrs. Gandhi gets bail in jeep scandal case **(Aug. 2)**. Indian Airlines Avro crashes near Bombay, killing 45. Satellite launch vehicle fails to put 40-kilo payload into earth orbit, plummets into sea (10). Damburst floods Morvi and Lilapur in Gujarat. Over 1000 dead (12). President's rule in Sikkim (18). Mrs. Gandhi withdraws support to the Charan Singh government (20). President dissolves parliament, orders year-end general elections and asks Charan Singh to head a caretaker government (21). Mr. M. Hidayatullah, consensus choice of political parties, as Vice-President of India (31). Nizam jewellery declared national treasure. Bombay airport fire **(Sept. 21)**. Syed Maudoodi, founder of Jamait-e-Islami, dies in New York (22). Operation (Milk) Flood-II launched **(Oct. 2)**. Jaya Prakash Narayan dies (8). Supreme Court stays the execution of all death sentences. Communal riots in Ahmedabad. Mother Teresa awarded Nobel Peace Prize (17). Troops called out in riot-torn Shillong (22). Arunachal Assembly dissolved, President's rule **(Nov. 3)**. Productivity-linked bonus to Railwaymen, P and T and Defence Civilian employees announced (13). Manipur under President's rule (14). Rioting and arson in Hyderabad and Calcutta after demonstrations against seizure of the Grand Mosque in Mecca (23). Capt. Dhyan Chand, Hockey wizard, dies **(Dec. 3)**. Kerala comes under President's rule (5). Assam comes under President's rule (12). Natural gas struck near Narasapur in A.P. (19). First unit of Kali power project in Karnataka commissioned (26).

1980 Polling in Seventh General Election ends **(Jan. 6)**. Devaraj Urs, Karnataka Chief Minister, resigns, following reverses in elections (7). Hitendra Desai, Commerce Minister and Henry Austin, Minister of State for Commerce resign from Charan Singh Ministry following their defeat in the Lok Sabha Poll (8). Care-taker Prime Minister, Charan Singh informs the President of his desire to resign (9) Mrs. Indira Gandhi's Congress (I) wins two-thirds majority in the new Lok Sabha (10). Gundu Rao sworn in Congress (I) Chief Minister of Karnataka following Devaraj Urs' resignation after poll debacle. (12). Mrs. Gandhi's new Ministry at Centre sworn in; R. K. Dorendra Singh sworn in as Chief Minister of Manipur (14). D. Ramachandran becomes Chief Minister of Pondicherry and Pratap Singh Rane, Chief Minister of Goa (16). Assam agitation turns violent; Army called out; Oil India Manager stoned to death; Gangong Apsong sworn in as Chief Minister of Arunachal Pradesh (18). India wins Madras Cricket Test and the series against Pakistan; Assembly elections in Kerala; Left Democratic Front wins absolute majority (21). Marxist-led left Front voted to power in Kerala; Haryana's Janata C. M. Bhajan Lal with 37 MLAs defects to Congress (I), continues as Congress (I) Chief Minister; Balram Jakher elected Lok Sabha Speaker (22). E. K. Nayanar (CPM) chosen to lead Kerala Ministry (24). Civilian Awards stopped by the Janata Government revived; Mother Teresa awarded Bharat Ratna (30).

Vaidyalingam Commission accepts four charges against Kanti Desai, son of former Premier Morarji Desai and 3 charges against Gayatri Devi, wife of Ex-Premier Charan Singh **(Feb. 3)**. R. C. Majumdar, noted historian, dies (11). Special Court dissolves itself by holding that its constitution in the first instance was null and void; Janata Ministry headed by Shanta Kumar in Himachal Pradesh resigns; a Congress (I) ministry headed by Ramlal takes office (14). Total solar eclipse (15). State Assemblies in Tamil Nadu, Maharashtra, U.P., Bihar, Orissa, M.P., Rajasthan, Punjab and Gujarat dissolved, ministries dismissed and President's rule imposed (17). Forty-six defence personnel killed in plane crash in Agra; C. M. Stephen wins Lok Sabha by-election from Gulbarga Constituency (23). Jagjivan Ram resigns as leader of Janata Parliamentary Party (27). K. Santhanam, eminent Congress leader, dies (28).

Nearly 700 injured in clash in Madras between police and AIADMK processionists **(Mar. 2)**. C. M. Stephen made Cabinet Minister at Centre; three more Ministers of State added (3). Chinese Ambassador Shem Jian presents credentials to President (4). Thirty-nine die as bus hits tree in Krishnanagar, 30 km from Calcutta (5). King Birendra of Nepal in Delhi (6). Jagjivan Ram "quits" Janata Party; Veerendra Patil made Cabinet Minister for Petroleum and Chemicals; Japanese special envoy Sunao Sunoda in Delhi; Father Mathew Mannaparambil shot dead in Sasarum (7). Mrs. Nandini Satpathy joins Congress (U) (9). C. B. Gupta (79) Janata Party Treasurer and veteran freedom fighter, dies in Delhi (11). Central Govt's talks in Delhi with Assam Students' Union and Gana Sangram Parishad fail (12). Bonus announced for P&T Staff (14). Eighteen die as Tirumala bus falls off ghat road; 200 blind persons marching to P.M.'s house in Delhi lathi-charged (16). Thirty die as boat with over 200 passengers sinks off Cochin (19). Janata-dominated Delhi Metropolitan Council dissolved (21). Prakash Padukone becomes the first Indian to win All-England Badminton Championship (23). SIET Women's College in Madras re-opens after a seven-week closure (27). Yasser Arafat, Palestine Liberation Organization leader, in Delhi: PLO given full diplomatic status by India (28). Bengal Congress (I) suspends "Assam blockade" started in retaliation to the Assam agitation against foreigners (31).

Charan Singh, Chairman, expels Raj Narain from Lok Dal; Raj Narain forms a new Janata (S) Party **(April 2)**. Janata Party splits again; members with RSS links form Bharatiya Janata Party with A. B. Vajpayee as President (6). Jagjivan Ram joins Congress (U) (8). Sanjay Gandhi and V. C. Shukla acquitted by Supreme Court in the *Kissa Kursi Ka* case (11). Mrs. Indira Gandhi in Gauhati talks to Assam students; students reject PM's proposals on foreigners' issue (12). Attempt on Mrs. Gandhi in Parliament House; knife-thrower arrested (14). Six more private sector banks nationalised (15). Elections announced for nine State Assemblies to be held on May 27 & 30 (17). Jamir sworn in as Nagaland C.M. (18). Mass picketing begins in Assam (22). Baba Gurbachan Singh, Nirankari Chief assassinated; son named new chief (24). Assamese poet Birendra Kumar wins 1979 Jnanpith Award (26). Curfew in Imphal following violence; violence and arson in Imphal, youths on rampage (27). Supreme Court bans handcuffing of prisoners (30).

H. N. Bahuguna resigns from Congress (I) Party posts ; Sobha, Best Actress Award winner dies at Madras **(May 1)**. Thirty-eight die as bus catches fire near Ujjain; 39 die in boat disaster in Broach (Gujarat) (7). Supreme Court rules Parliament has no unlimited power to amend constitution; Court also upholds validity of death sentence (9). Bahuguna quits Congress (I) and resigns from Lok Sabha (20). Thirty-three die in police firing in Assam; widespread arson and clashes in State as All-Assam Minority Students Union launches counter-agitation (29). Twenty-two die as newly built flats collapse in Thane (Maharashtra (31).

AIADMK of M. G. Ramachandran wins majority in Tamil Nadu Assembly election; Congress (I) wins in U.P., M.P., Gujarat, Rajasthan, Punjab, Maharashtra and Orissa **(June 1)**. V. Bhaskaran, selected to Captain Indian Olympic Hockey Team (7). 15 more ministers added to Union Cabinet; Darbara Singh sworn in as Punjab C.M. and Dr. Jagannath Misra as Bihar C.M. (8). M. G. Ramachandran's second AIADMK Ministry takes office (9). Armed Tribals on the rampage in Tripura; 300 dead; President's rule in Assam extended for six months by Lok Sabha (10). Sanjay Gandhi appointed Congress General Secretary (13). Finance Minister Venkataram presents Rs. 1417 crore deficit budget in the Lok Sabha; woman stripped and paraded by police in Baghpat (18). Sanjay Gandhi dies in plane crash in New Delhi (23). Former President V. V. Giri passes away (24). One hundred die as bus falls into stream in Bilaspur; 150 die in landslide in Uttarkhashi district (UP) (25). Oil find off A.P.; Gas near Andamans; Assam bandh paralyses normal life in the State (26).

Bus ambushed near Agartala by extremists; eight killed **(July 2)**. India recognises Heng Samrin Govt. in Kampuchea (7). Congress (I) gets absolute majority in Rajya Sabha (12). India orbits satellite; SLV-3 Rocket puts Rohini satellite in orbit (18). Anti-price agitation in Karnataka; five die in Bijapur Police firing (28). India regains Olympic Hockey title (29). Mohamed Rafi, noted singer, dies in Bombay (31).

Inspector Palanisamy, two constables and three Naxalites die in an explosion near Tirupattur. **(Aug. 7)**. Split in Akali Dal—Badal and Talvandi groups part company (9). Gas struck off Porto Novo (10). Allahabad High Court dismisses election petition against Mrs. Gandhi (12). Riots and police firing leave 86 dead in Moradabad; curfew imposed; Floods hit a million people in Bihar (13). Curfew in Old Delhi following riots (15). Riots in Aligarh; Army called out (17). Indefinite curfew in Allahabad (19). Cloudburst in Bombay—45 dead (22). Kudremukh Project in Karnataka completed (23) Forty-one die as stored dynamite explodes in Batlagundu, near Madurai (24). Woman burnt alive in Dharmapuri by an angry mob suspecting her to be a child-lifter (25).

Another woman burnt to death near Salem on suspicion of being a child-lifter **(Sept. 3)**. Second Commonwealth Regional Heads of Government Conference opens in New Delhi (4). M.P. High Court sets aside the election of Union Minister V. C. Shukla (5). About 100 people killed in land-slides in Darjeeling (7). Over 500 perish in Orissa floods (19). K. B. Sundarambal dies (24). President Sanjiva Reddi in Moscow (29).

Seventy-five Naga rebels killed in clash with rival groups **(Oct. 8)**. J.&K. Assembly Hall in Srinagar destroyed by fire (9). T. Anjiah becomes Andhra Pradesh Chief Minister (11). Centre nationalises Maruti company (14). Assam talks in Delhi fail again (16). Eleven more ministers added to Union Cabinet (19). One hundred persons drowned in boat capsize in W. Godavari (23). Union Railway Minister Kamalapathi Tripathi resigns (25). President dismisses Tamil Nadu Governor Patwari; Saddiq Ali named successor (26). Thirty-one persons killed in a train accident near Kanpur (31).

National Integration Council constituted **(Nov. 6)**. Centre takes over Auroville; Agitation in Nasik for higher price for onions and sugarcane (10). Kedar Pande made new Railway Minister (12). Instant Communication facilities to five remote areas—Car Nicobar, Andamans, Kavaratti and Leh-inaugurated (15). All members of Railway Board replaced (16). Manipur Chief Minister Dorendra Singh resigns (19). Air India ground staff end 29-day strike (22). Prince Charles, heir to the British throne, arrives in Delhi (24). Justice Apajee Varadarajan, a Harijan, appointed to the Supreme Court (29).

Parliament condemns blinding of undertrials in Bhagalpur; Supreme Court orders enquiry into Bhagalpur blinding; former Railway Minister K. Hanumanthiah dies in Bangalore **(Dec. 1)** Andhra Pradesh Ministry expanded to a record strength of 61 ministers (2). President Suharto of Indonesia in Delhi (4) President's rule (imposed on

Dec. 12, 1979) in Assam revoked; Mrs. Anwara Taimur heads a new Ministry in Assam (6). Soviet President Leonid Brezhnev arrives in New Delhi on a State visit (8). Five killed in police firing in Assam (22). 1980 *Jawaharlal Nehru Award* for international understanding for Mrs. Barbara Ward; Nationalisation of Maruti Ltd. passed by Parliament: Compensation payable placed at Rs. 4.34 crores (23). Farmers' agitation started in Tamil Nadu and Karnataka spreads to Maharashtra. Maharashtra farmers organise a 'long march' to Nagpur. The long march ends up as a victory march of over 15,000 farmers at Nagpur, where the Maharashtra legislature was in session. Both houses of the Maharashtra legislature were prorogued in a huff and the leaders arrested. They included S. M. Joshi, Janata party leader, former Central Ministers, George Fernandez and Chandrajit Yadav, C.P.I. General Secretary, C. Rajeshwara Rao, former Chief Ministers Devi Lal (Haryana) and Karpoori Thakur (Bihar), Rajasthan leader Kambha Arya Ram, and Cotton Growers' leader M. G. Bokare. All persons arrested were subsequently released (26). Farmers' agitation in Tamil Nadu turns violent during the one-day bandh called by the Tamil Nadu Agriculturists Association. In one place a police constable was hacked to death and a police officer seriously injured by the unruly mob. In two other places police fired into the crowds killing some and wounding many. Total casualties for the day, including the police constable, numbered 8. Total number of persons arrested came to 10,000. 45th Amendment.

81 Eighth International Film Festival opens in New Delhi **(Jan. 3)**. World Tamil Conference opens in Madurai (4). Special Bearer Bonds (Immunity and exemptions) Ordinance, 1981, promulgated to attract black money; Satyagraha in Assam (12). Mr. B. K. Nehru, former Ambassador to the US, appointed Governor of Jammu & Kashmir (15). Central Government offers full statehood to Mizoram on condition that the Mizo National Front gives up insurgency. India's 'Akrosh' and Bulgaria's Unknown Soldier's Patent Leather Shoes share the Golden Peacock award for the best film at the 8th International Film Festival (17). Three new judges for Supreme Court appointed. Mr. M.M. Ismail, Chief Justice of Madras High Court, transferred to Kerala and Mr. K.B.N. Singh, Patna High Court Chief Justice, to Madras High Court (19). Five die in Karnataka police firings following violence in the wake of Bangalore Bandh (21). The Jammu and Kashmir Chief Minister Sheikh Abdullah names son Dr. Farooq Abdullah his successor (23). Third airline feeder service Vayudoot inaugurated (26). Madhya Pradesh Government sacks 135 police staff for participation in demonstration in Gwalior on January 20. All Medical Colleges in Gujarat closed for six months as students' agitation against reservation of seats for backward classes takes violent turn (28).

Violence in Ahmedabad Police firing **(Feb. 2)**. Prime Minister Mrs. Indira Gandhi visits Minicoy Islands. Mrs. Madhuri Shah appointed Chairman of the University Grants Commission (3). Preparatory meeting of the non-aligned Foreign Ministers conference (5). Resignation of 60 AP ministers accepted. Army called out in Ahmedabad. Sixtyone die in circus fire in Bangalore (7). Fortyfour ministers take office in Andhra Pradesh. Census operations begin(9). Tamil Nadu and Kerala Governments decide on judicial inquiry into Spirit Scandal; Tamil Nadu names P. S. Kailasam, a retired Supreme Court Judge, for the enquiry (11). Nineteen dead, 51 injured in an accident involving two fast trains and a goods train near Vaniyambadi about 200 km from Madras.

Bomb blasts damage the transmitters of All India Radio at Dibrugarh in Upper Assam and at Jhalukbari near Gauhati (12). Fire wrecks Spencer's buildings on Anna Salai in Madras (13). Medicos suspend stir in Gujarat (18). Railway fares and freight to cost 10 to 15 per cent more. Railway budget proposals placed before Parliament. Public sector staff in Bangalore suspend 56-day-old strike (19). Mahamastabisheka of the statue of Jain ascetic, Gomateswara, at Sravanabelagola (Karnataka) performed. Four lakhs witness the ceremony (22). Five persons were killed in police firings, and a train set on fire in Ahmedabad on the Gujarat Bandh day (26). The Congress (I) Ministry in Manipur resigns without facing a no-confidence motion. M. H. Beg, former Chief Justice of India, named Chairman of the Minorities Commission in succession to Mr. M. A. Ansari (27).

Police open fire on two warring groups in Mehsana district, Gujarat. Curfew is reimposed. More than 3000 persons were arrested in different parts of Tamil Nadu in connection with the DMK agitation of burning copies of the Government Order containing the notification appointing the Justice Kailasam Commission to probe the spirit scandal **(Mar. 1)**. The 77-day-old strike by employees of the Bangalore-based public sector industries is called off (12). Governors' meet opens in Delhi (14). Census Commissioner P. Padmanabhan says India's population is 68.38 crores according to census results (18). Mrs. Gandhi asks the Civil Supplies Minister V. C. Shukla to resign (19). Minting of three-, two- and one-paise coins discontinued (20). Tamil Nadu Government relaxes Prohibition (21). Mr. R. K. Vyas, Pondicherry Governor, succeeds Mr. L. P. Singh as Assam Governor (25). Several Opposition parties, including CPI(M) and CPI, stage a massive kisan rally in New Delhi (26). Bibinagar—Nalgonda railway link is inaugurated by the AP Chief Minister Mr. T. Anjiah (27). The CPI central executive decides to expel its former chairman, Mr. S. A. Dange, for his anti-party activities (29). Congress (I) calls for Bengal Bandh; Assam drifts towards constitutional crisis as 116-day-old Congress (I) ministry headed by Mrs. Anwara Taimur is unable to get through Appropriation (vote on account) Bill 1981 (31).

Assam Governor promulgates an ordinance, Assam Appropriation (vote on account) Ordinance 1981 to overcome constitutional crisis **(April 1)**. LIC staff under five unions launch strike throughout the country; Supreme Court orders payment of bonus (2). Seven die in bandh violence in West Bengal, following a Congress (I)–organised 12-hour bandh (3). Nine killed and several others injured in police firing in Nippani (Karnataka) following riot by farmers. Upper Assam Commissioner Mr. E. S. Parthasarathi killed in bomb outrage. Congress (I) loses Chirala seat to the Janata Party in by-elections to Andhra Pradesh Assembly (6). Bengali film "Aakaler Sandhane" wins 1980 Swarna Kamal award for best film, Dada Saheb Phalke award goes to P. Jairaj (7). Forty-six die in a road accident on the Sri Sailam ghat road in Andhra Pradesh. S. A. Dange, one of the founders of the communist movement, expelled from the Communist Party of India. The 105-day-old anti-reservation agitation by Gujarat students and junior doctors withdrawn unconditionally (13). The British Prime Minister Mrs. Margaret Thatcher arrives. No common ground in talks held with Mrs. Indira Gandhi. 14-day strike by LIC employees called off following Supreme Court orders to the management to make bonus payments within seven days (15). 13 tribals killed in police firing in Induvalli village, Andhra Pradesh. 38-day-old agitation by tobacco growers in

Nippani called off (21). The Finance Minister Mr. R. Venkataraman announces new concessions to export-oriented units (22). Police recover explosive material from some parts of Ahmedabad (26). Dr. G. D. Siddhu, retired Director, Regional Research Laboratory, Hyderabad, appointed Director General of Council of the Scientific and Industrial Research. Soviet military team in Delhi (27).

Sale of bearer bonds fetches less than Rs. 400 crores **(May 1)**. Bihar Government orders collective fines to be imposed on riot-hit areas in Nalanda district. Death toll, 48 so far. Dacoits massacre Harijans in four villages of Etah district in UP (4). Workers of the Bangalore-based public-sector undertakings go on a rampage. Police firing. Fasting Joint Action Front leaders removed to hospital. Lock out declared in HAL, Bharat Earth Movers, BEL and Indian Telephone industries (6). Riots continue in Bangalore. Buses burnt (7). 16-member Ministry led by Capt. W. A. Sangma, Congress -(I), sworn in Meghalaya (8). Bangalore public sector labour unions call off 12-day-old hunger strike (10). The Union Home Minister starts talks with Assam agitation leaders (16). Karnataka Minister for Sericulture and Small-scale industries, Mrs. Renuka Rajendran, resigns, following a criminal case in which she is later acquitted (20). Naxalites raid Bengal police camp, three constables injured (24). Y. B. Chavan resigns from Congress (U) (26). Case registered against Rajasthan Mining Minister, Nana Lal, for performing child marriages. Andhra Pradesh Panchayat poll held (27). Joint Action Front of the Bangalore-based public sector unions accepts the proposals made by the Union Communications Minister Mr. C. M. Stephen. More than 15 million hit by drought in Rajasthan (29) The President Mr. Sanjiva Reddi leaves for Nairobi. Lock-out in public sector units in Bangalore to be lifted in phases (30). SLV-3 puts Rohini in orbit from Sriharikota (31)

General K. V. Krishna Rao assumes charge as the Chief of Army Staff **(June 1)**. Hundreds drowned as seven bogies of the 416 Down Samstipur-Banmanmukhi Passenger train plummets into the Kosi river in Bihar (6). Malayalam fiction and travelogue writer S. K. Pottekkat named winner of the Jnanpith Literary award for 1980, for his autobiographical novel 'Oru Desathinte Katha' (Story of a Place) (7). Karnataka Congress (U) loses status of main Opposition in the Assembly (11). Mr. Rajiv Gandhi and Begum Abida Ahmed win by-elections from UP constituencies (15). Judicial enquiry into the spirit scandal begins in Trivandrum (17). The Centre appoints S. K. Ray, retired Chief Justice of the Orissa High Court, as the one—man Commission of Enquiry to go into the spirit scandal case (18). APPLE, India's first geostationary experimental telecommunications satellite is launched into orbit from Kourou, French Guiana. The Buckingham and Carnatic Mills in Madras reopen after a closure of 5½ months. The June 14 polling in the Garhwal Parliamentary constituency in UP is declared void and fresh poll is ordered (19). Air Marshal Dilbagh Singh is appointed Chief of Air Staff (24). Mr. Huang Hua, Chinese Foreign Minister, arrives in New Delhi for talks (26). Assam Chief Minister Mrs. Anwara Taimur resigns (28). President's rule imposed in Assam (30).

Over 350 die in liquor tragedy in Bangalore and Mysore **(July 7)**. Mr. Justice Mohammed Ismail resigns as Chief Justice of Tamil Nadu. Mr. Ismail had been transferred in January to Kerala and had been on leave since then (8). Boiler bursts in Surat textile mill—nearly 100 feared dead (9). Govt. increases prices of petrol, diesel, kerosene, cooking gas and furnace oil (10). Stabbing cases in Hyderabad; curfew imposed. Shiv Charan Mathur sworn-in in place of Jagannath Pahadia as Rajasthan Chief Minister (13). Assam talks between Central Govt. and AASU and AAGSP adjourned (15). Toddy and arrack shops reopened in Madras. India's first three-axis stabilised experimental communication (APPLE) put in its slot (16). Curfew relaxed in Hyderabad (17). Worst deluge in centuries in Rajasthan. Jaipur cut off (19). TV Programme successfully relayed through APPLE (22). Election Commission holds Congress (I) as the real Congress—and derecognises Congress (U) led by Mr. Devaraj Urs. Prakash Mehrotra appointed Governor of Assam and Meghalaya and S. M. H. Burney, Governor of Manipur, Tripura and Nagaland (23). Ordinance empowers Central Govt. to ban strikes in any essential service (27).

Karnataka Minister C. M. Ibrahim resigns after registration of case against him in Bhadravathi **(Aug. 4).** Jagjivan Ram heads breakaway Congress (U) and calls new party Congress (J) (5). Fifty persons given life terms for killing 14 Harijans of Pipra village in Patna district (5). The Governor of Rajasthan Mr. Raghukul Tilak dismissed (8). Many Secretaries in Central Ministries reshuffled. Prime Minister Indira Gandhi leaves on African tour. Dacoits kill nine UP policemen (9). Assam talks again adjourned without solution. French Foreign Minister Claude Cheysson in Delhi on two-day visit (23). Mrs. Jeanne Kirkpatrick, US. President Ronald Reagan's envoy to UN, in Delhi (24). Mr. Sharad Pawar, Maharashtra leader, elected President of Congress (U) (25). Congress (I) trounced in municipal corporation elections in Vijayawada and Visakhapatnam. Nikolai Firyubin, Soviet Deputy Foreign Minister, in Delhi after visiting Pakistan (28). Air Chief Marshal Dilbagh Singh succeeds Air Chief Marshal Latif as Air Chief (30).

New Oil field B-57, 35 km from Bombay High, discovered **(Sept. 4).** Lok Sabha Speaker holds no privilege had been breached by the Finance Minister R. Venkataraman's statement on fund collections by the Maharashtra Chief Minister A. R. Antulay (7). The first batch of 18 members of a pilgrim party leaves for Kailas and Manasarovar in Tibet—the first batch to go there in 20 years. Lala Jagat Narain, veteran journalist and freedom fighter, shot dead in Ludhiana (9). B. D. Pande appointed Governor of West Bengal to succeed T. N. Singh who resigned. The Bombay—Madras Janata Express stranded as track sinks due to flash floods. Bridge collapses near Bangarpet. Bangalore-Madras train services stopped for more than a week (10). Rajya Sabha Chairman Hidayatullah disallows privilege charge against R. Venkataraman on the Antulay Fund collection (11). Tamil University inaugurated in Thanjavur (15). Dr. M. Santappa appointed new Vice-Chancellor of Madras University (16). Thirty die in a blast in cracker factory in Sivakasi, Tamil Nadu (19). Sant Jarnail Singh Bhindranwale arrested in connection with Lala Jagat Narain's murder—violence follows—eight die in police firing (20). Mrs. Indira Gandhi in Jakarta confers with President Suharto of Indonesia (23). Oil struck in off-shore well in the Cauvery basin 50 km off Vedaranyam coast. Mrs. Indira Gandhi in Fiji (25). Five Khalistan activists hijack Indian Airlines Boeing 737 to Pakistan with 117 passengers; 66 freed on arrival in Lahore (29). Pakistan Commandos dressed as cleaners overpower five hijackers of the Indian Airlines Boeing freeing 45 hostages on board in a 28-minute operation. Delhi asks Pakistan to extradite hijackers (30).

Activists of the Dal Khalsa who masterminded the hijacking of Indian Airlines arrested **(Oct. 1).**

Significant gas find on eastern outskirts of Agartala (5). P.M. invites Akali leaders for talks (12). Sant Jarnail Singh Bhindranwale released from judicial custody (15). Congress (S) pulls out of ruling Marxist-led Left Democratic Front in Kerala. Bombay High Court freezes funds of the Indira Pratibha Prathisthan and the Konkan Unnati Mitra Mandal. Cash reserve ratio of scheduled commercial banks raised from seven per cent to eight per cent of the net demand ahd time liabilities by Rserve Bank of India (16). Over 120 villagers drowned in tank burst in remote village of Gopinatham on Karnataka-Tamil Nadu border (19). Twenty-one-month-old Left United Front Ministry led by Mr. E. K. Nayanar, resigns in Kerala. Union Finance Ministry announces reissue of special bearer bonds with effect from Dec. 1 to Dec. 31 (20). Kerala under Central rule (21). Punjab Janata leader, Mohinder Paul, shot dead at Narur Panchta, Kapurthala district (23). Seven rear bogies of Bombay Mail derail. No loss of life. PM back in Delhi after attending the Cancun summit (28).

Cyclone hits Gujarat Coast—9 dead. Experimental TV station inaugurated in Bangalore **(Nov. 1)**. Central Govt. hands over to Supreme Court correspondence between the Chief Justice of India, the Law Minister and others on the transfer to Madras of the Patna High Court Chief Justice (2). Another round of Assam talks in Delhi ends inconclusively (3). Supreme Court stays all executions in the country pending disposal of petition challenging the validity of death penalty. Sofia University (Bulgaria) honours Mrs. Gandhi (7). Mrs. Gandhi in Italy; delivers McDougall lecture at FAO; meets Pope (9). IMF board clears 5 billion SDR loan for India (10). Mrs. Gandhi in Paris. France offers easy credit to buy Mirage Fighters. 1981 Nehru Award for Prof. and Mrs. Gunnar Myrdal (12). Re-polling again put off in Garhwal parliamentary constituency. Children's Film Festival opens in Madras (14). Vice-Admiral Dawson named new chief of Naval Staff (18). Extremists in Punjab kill two policemen. Two goondas massacre 24 persons in Deoli in U.P. (19). Bhaskara is launched from Soviet Cosmodrome. PM rules out replacement of Antulay, Maharashtra CM (20). Sri Krishna Deva Raya University inaugurated in Anantapur (22). Milton Obote, Ugandan President, in Delhi (23). Air India plane hijacked from Seychelles; crew, passengers freed in Durban, S. Africa, where plane lands. Hijacking done by mercenary force sent to topple the Government in Seychelles. Akali leaders meet Mrs. Gandhi and promise restraint (26). Soviet Defence Minister Admiral Sergei Gershkov in Delhi (27). The working committee of Congress (S) rejects Kerala unit's plan to join Congress (I) in forming a new Ministry. Blast kills three at Mehta Chowk headquarters of Sant Bhindranwale (29).

President Sanjiva Reddi inaugurates in Madras the Golden Jubilee celebration of Indian talkie **(Dec. 1)**. President Sanjiva Reddi arrives in Jakarta (4). Forty-five people, majority of them children, killed in a stampede in Qutb Minar, Delhi (5). French Minister for Research and Development, Jean Pierre Chevenement in Delhi. 49 people perish in fire near a temple in Ahmedabad. President Sanjiva Reddi in Bali (6). Ry. freight rates raised by 10 to 15 p.c. President Sanjiva Reddi in Nepal (7). India-China talks open in Beijing (10). Nearly 60 people killed in Bengal cyclone (11). Jathedar Santokh Singh, President of Delhi Gurdwara Prabhandak Committee, shot dead, assassin also shot dead by bodyguard (21). Orissa's Planning Minister, Mr. Lalit Mohan Gandhi, resigns following conviction in a criminal case (22). Congress (S) unit in Kerala defies national leadership and decides to join Ministry headed by Congress (I) (23). New Madras-Penang undersea cable commissioned. Parliament votes to restore the 'original' character of the Aligarh Muslim University (24). Andhra Pradesh Congress (I) expels ten members including former Ministers for "anti-party" activity (25). President's rule revoked and a new Government led by the Congress (I) leader Karunakaran, installed in Kerala. Supreme Court upholds law for detention without trial but lays down guidelines; finds LIC wage regulation by statute cannot be retroactive. Planning Commission finds execution of Plan schemes tardy, decides to cut outlays in some sectors. PM wants 1982 observed as "production year" (28).

Congress (I) loses nine of 29 seats in elections to the Andhra Pradesh Legislative Council, and the by-election to the Lok Sabha from Sagar in Madhya Pradesh; wins the Kosta (M.P.) Assembly seat (29). Supreme Court holds transfer of judges valid. Ten Harijans murdered in Sadipur village of Manipuri district, U.P. (30). Assam road blockade agitation turns violent. Curfew imposed in Dimow (31).

90. THE COUNTRY

India occupies a strategic position in Asia, looking across the sea to Arabia and Africa the west and to Burma, Malaysia and the Indonesian Archipelago on the east

Geographically, the Himalayan ranges had kept India apart from the rest of Asia. But the fertility of the Indo-Gangetic belt had proved to be such an irresistible magnet that hordes of people had pressed into India through the mountain passes from immemorial times. The geographical insularity, imposed by the mountains was thus broken time and again. Similarly the open seas on both sides of the Indian peninsula, far from being a barrier to free intercourse with other lands, turned out to be rich seaways of trade and exchange of ideas with countries lying far away. Thus, neither the mountains nor the seas could keep India isolated from the mainstream of Asiatic history. On the other hand, the life giving rivers that gushed down from the inaccessible mountains to the turbulent seas enabled India to open the first chapter of Asian history. This began with the Indus civilization, 8000 years ago.

India lies to the north of the equator between 8" 4' to 37° 6' north latitude and 68° 7' to 97° 25' east longitude. It is bounded on the south west by the Arabian Sea and on the south east by the Bay of Bengal. On the north, north east and north west lie the Himalayan ranges. The southern tip, Cape Comorin (Kanyakumari), is washed by the Indian Ocean.

India measures 3214 km from north to south and 2933 km from east to west with a total land area of 3280483 sq. km. It has a land frontier of 15200 km and a coastline of 6083 km. Andaman and Nicobar islands in the Bay of Bengal and Lakshadweep (islands) in the Arabian Sea are parts of the territory of India.

India shares its political borders with Pakistan on the west and Bangladesh and Burma on the east. The northern boundary is made up of the Sinkiang province of China, Tibet, Nepal and Bhutan.

Geological Structure. Geologically, the sub-continent of India (including Pakistan and Bangladesh) is made up of three distinct crust blocks.

(1) *Peninsular India* or the Deccan Plateau, south of the Vindhyan mountains, (2) *Himalayan ranges* and their offshoots that bound India on the west, north and east, (3) *Indo-Gangetic Plain* formed by three big rivers, the Indus, the Ganga and the Brahmaputra. This plain separates the Deccan Plateau from the great mountain ranges.

These three blocks can be conveniently divided into two geological areas, (1) the Peninsular India, comprising the Deccan Plateau and its adjuncts and (2) the extra-Peninsular India, made up of the Himalayan mountains and the extensive Indo-Gangetic plain

Peninsular India or the Deccan

plateau is geologically the oldest portion of India's land surface and is believed to have been part of a super-continent which contained S. America, Africa, Australia, Antarctica and India.‡

Extra-peninsular area comprising the Himalayas and the Indo-Gangetic Plain "appears to have been a comparatively weak and flexible part of the earth's crust which has undergone a great deal of crumpling, folding and deformation. It has lain under the sea for the greater part of its history and has undergone, at a very late geological epoch, an enormous amount of compression and mountain building material."

91. PHYSIOGRAPHY

India has seven major physiographic regions: (1) Northern Mountains including the Himalayas and the mountain ranges in the north-east, (2) The Indo-Gangetic plain, (3) Central Highlands, (4) Peninsular plateau, (5) East Coast, (6) West Coast, (7) Bordering seas and islands.

All the major land forms, hills, mountains, plateaus and plains, are well represented in India. Much of the land surface of India has developed a plateau character. There are extensive plains either flat or rolling at levels ranging from 300 to 900 metres, dotted with conical or rounded hills or traversed by flat-topped ridges. These are mostly in the central highlands and the peninsular plateau of the Deccan.

The alluvial plains, however, have been the most important land area in India, historically. In the Indo-Gangetic belt, level lands thick with lush vegetation stretch for miles and miles. These plains have lured successive streams of invaders into India—the Aryans, Scythians, Huns, Pathans and Mongols. They have fostered the growth of great empires like those of the Mauryas, the Guptas and the Mughals.

MOUNTAIN SYSTEM

India has seven principal mountain ranges: (1) the Himalayas, (2) the Patkai and other ranges bordering India in the north and north east, (3) the Vindhyas, (4) the Satpura, (5) the Aravalli, which separates the Indo-Gangetic plain from the Deccan Plateau, (6) the Sahyadri, which covers the eastern fringe of the West Coast plains and (7) the Eastern Ghats, irregularly scattered on the East Coast of India and forming the boundary of the East Coast plains.

Himalayas, the highest mountain-system in the world, is also one of the world's youngest mountain ranges. It extends practically uninterrupted for a distance of some 2500 km and covers an area of about 500,000 sq. km. It contains the world's highest mountain peak, *Everest* and some ten peaks rising above 25,000 ft. It appears to have risen from the bottom of the sea as a result of a collision between the drifting Indian (peninsular) plate and the Tibetan block of South Asia about 50 million years ago. The Himalayas reached their present heights much later.

Many geologists think that the recurring earthquakes and tremors in the Himalayan range signify that the Himalayas is still shifting and possibly rising higher. Says Dr. K.S. Vaidya, "The restlessness of the Himalayas means that the moving (Indian) peninsula continues to prod and push it (Himalayas). Whenever accumulating stresses and strains are released through fracturing or cracking of the ground, it trembles, moves forward, up or down."

Through the millions of years that the Himalayas was rising, it was also being steadily eroded. This continuous erosion brought into being the three great rivers— Indus, Ganga and Brahmaputra. The alluvial soil brought down by these rivers through thousands of years filled up the vast depression between the Deccan plateau and the rising Himalayas and have brought into existence the present Indo-Gangetic plain.

The Himalayan mountain system is divided into three parallel zones: (1) The *Greater Himalaya*, the main range rises to an average elevation of 6100 m. above mean sea level. This is the birthplace of multitudes of glaciers, some of which are among the longest in the world. (2) The *Lesser Himalaya* lying south of the Greater Himalaya is the middle range with an average height between 2600 and and 4600 m. The Lesser Himalaya does not support any glaciers, as its altitude is below the snowline. (3) The *Outer Himalaya* comprises the mountain range that lies between the Lesser Himalaya and the plains of India. It has an average elevation of 1000-1300 metres.

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‡ Part I. Continental Drift.

Patkai and allied mountain ranges run along the Indo-Bangladesh-Burma border and may collectively be called *Purvachal* or eastern mountains. These ranges forming an arc must have come into existence along with the Himalaya.

Aravalli range in north-western India is one of the oldest mountain systems in the world. The present Aravalli range is only a remnant of the gigantic system that existed in prehistoric times with several of its summits rising above the snow line and nourishing glaciers of stupendous magnitude, which in turn fed many great rivers.

Vindhyan range traverses nearly the whole width of Peninsular India—a distance of about 1050 km with an average elevation of some 300 metres. The Vindhyan range appears to have been formed by the weathered products of the ancient Aravalli ranges.

Satpura range, another ancient mountain system, extends for a distance of 900 km with many of its peaks rising above 1000 metres. It is triangular in shape, with its apex at Ratnapuri and two sides running parallel to the Narmada and Tapti rivers

Sahyadri, or Western Ghats, with an average height of 1200 metres, is about 1600 km long and runs along the western border of the Deccan Plateau, from the mouth of the river Tapti to Cape Comorin (Kanyakumari), the southernmost point of India. It overlooks the Arabian Sea, and catches the full force of the monsoon winds, thus precipitating heavy rains on the West Coast.

Eastern Ghats, bordering the East Coast of India, is cut up by powerful rivers into discontinuous blocks of mountains. In its northern parts between the Godavari and Mahanadi rivers it rises to above 1000 metres.

RIVER SYSTEM

There are three main watersheds in India. (1) Himalayan range with its Karakoram branch in the north, (2) Vindhyan and Satpura ranges in Central India and (3) Sahyadri or Western Ghats on the West Coast. All the major rivers of India originate in one or the other of these watersheds.

Rivers of India are estimated to carry 1,683,000 million cubic metres of water per year and in the process they do a lot of constructive work. They build alluvial terraces in the Himalayas, piedmont plains at the foot of the hills and mountains, flood plains in their courses throughout and deltas at their mouths. The Indo-Gangetic plain in North India is the creation of the Indus, the Ganga and the Brahmaputra. The East Coast deltas are the handiwork of Mahanadi, Godavari, Krishna, Cauvery and Pennar rivers, while the West Coast deltas have been formed by Narmada and Tapti in the extreme north and by a host of lesser rivers—Sharavati, Netravati, Bharatapuzha, Periyar and Pamba in the far south.

The rivers of India may be broadly classified into two categories, the Himalayan group and the Deccan group.

Himalayan System. The rivers of the Himalayan System are geologically younger than those of the Deccan and are rapid torrential streams which are still in a very youthful or immature stage of development. They are continuously at work in degrading or lowering their channels and cutting deep gorges, hundreds of metres deep through the mountain paths of their tracks. The main rivers of the Himalayan group are: *Indus, Ganga* and *Brahmaputra*. These rivers are both snow-fed and rain-fed and have therefore continuous flow throughout the year. Himalayan rivers discharge about 70 per cent of the total discharge of the Indian rivers into the sea. This includes about 5 per cent from central Indian rivers, that is, rivers which rise in central India. They join the Ganga and drain into the Bay of Bengal.

The Indus, which the Aryans called the Sindhu, has lent its name to India. Its valleys on both sides have been the seat of a civilization, that was not only anterior but also superior in many respects to the fabled civilizations of Sumeria and Egypt. This historic river has major tributaries—Jhelum, Chenab, Ravi, Beas and Sutlej. These in turn have inspired the name Punjab (punj=five & ab=river), the Land of Five Rivers. The Indus rises from Mount Kailas in Tibet and traverses many miles through the Himalayas before it is joined by its tributaries in the Punjab. Thereafter it passes into Sind (Pakistan) to fall into the Arabian Sea.

The Ganga, famous alike in legend and history, is considered that most sacred by the Hindus. It covers, what is called the heartland of India, which was the main centre of the ancient Aryan culture.

sacred river by the Hindus. It rises near the glacier Gangotri in the Himalayas and flows through Uttar Pradesh, Bihar and Bengal to fall into the Bay of Bengal. Ganga and its tributaries, Jamuna, Gumta, Garga, Sarda, Gandak Chambal, Sone and Kosi, spread out like a fan in the plain of Hindustan thus forming the largest river basin in India, with an area, one quarter of the total area of India.

The Brahmaputra, rising in Western Tibet, flows for some 800 miles through the Himalayas, then turns south-west and then south, joining the easternmost branch of the Ganga—the Padma—and empties together with Ganga into the Bay of Bengal.

Deccan System. The rivers of Deccan denuding their beds for long geological ages have developed flat valleys with low gradients. The major Deccan rivers are *Godavari, Krishna, Cauvery, Pennar, Mahanadi, Damodar, Sharavati, Netravati, Bharatapuzha, Periyar, Pamba, Narmada,* and *Tapti.* These rivers are entirely rain-fed with the result that many of them shrink into rivulets when the hot season opens. The Deccan rivers contribute about 30 per cent of the total outflow in India. Of this, the rivers that flow from west to east account for 20 per cent and those from east to west about 10 per cent.

The Godavari, Krishna, Cauvery and Pennar all rise in the Western Ghats and traverse the plateau and the East Coast, to fall into the Bay of Bengal. Godavari has the second largest river basin in India, comprising about 10 per cent of the total area of India. The Krishna basin is the second largest in the peninsula, and the third largest in the whole of India

The Mahanadi and the Damodar rise in the north west of the plateau and flow east into the Bay of Bengal. The Mahanadi forms the third biggest basin in the peninsula and fourth in all India.

The Narmada and the Tapti rising in the northernmost extremity of the plateau fall into the Gulf of Cambay in the Arabian Sea. The Narmada has a fairly extensive basin, next only to those of Krishna and Mahanadi.

Rivers Sharavati, Netravati, Bharatapuzha, Periyar and **Pamba** rise in the Western Ghats and cross the West Coast to fall into the Arabian Sea. These rivers are comparatively small with limited catchment areas and minor basins

92. FLORA AND FAUNA

Flora

Few other countries of comparable size possess such a rich and varied vegetation as India. Situated as it is between 8° 4′ N. and 37° 6′ N. of the equator, the country has a great latitudinal spread which means a wide range of temperature conditions. Altitudinally the extremes are even greater, ranging from sea-level to the highest mountains in the world. The humidity and rainfall also vary greatly, from the lowest point in Thar desert to the highest in the hills of Meghalaya where Cherapunji with an annual rainfall of 1080 cm is reputedly the rainiest spot in the world.

The Gazetteer of India (1965) divides India into eight botanical regions:

(1) Deccan, (2) Malabar, (3) Indus plain, (4) Ganga plain , (5) Assam, (6) Eastern Himalayas, (7) Western Himalayas and (8) Andamans.

Deccan Region comprises the entire comparatively dry elevated tableland of the Indian Peninsula. Palms of different kinds are endemic to this region.

Malabar Region covers the entire West Coast and the mountains of the Western Ghats. This is a region rich in tropical vegetation. The forest areas abound in hard wood, like rosewood, ironwood and teak with numerous varieties of soft wood and bamboos of different kinds.

Indus region comprises the plains of Punjab, Rajasthan, Yamuna river, Kutch and northern Gujarat. This is very poor in endemic plants.

Ganga region covers the entire area from Yamuna to Bengal and Orissa. Here the forests are of widely differing types. Sal forests, however, dominate.

Assam region is made up of the Brahmaputra and Surma Valleys with the intervening hill ranges. Here the vegetation is luxuriant, with tall savanna grass, broad-leaved forests and thick clumps of bamboos.

Eastern Himalayan region sweeps eastward from Sikkim and embraces Darjeeling, Kurseong and other places. About 4000 species of flowering plants including 20 palms are estimated to occur in this region. In the temperate zone of this region, we find different broad-leaved species, many laurels and maples, alder, birch, conifers and junipers. Rhododendrons, dwarf willows and bamboos are other plants that abound in this region.

Western Himalayan region extends from the Kumaon Hills to Kashmir. *The lower zone* of this region is practically covered with sal forests, except where the savannah lands break up the sal belt. Among palms, only 5 species occur in this region. *The temperate zone* of this region contains forests of conifers and broad-leaved temperate trees. Higher up, appear deodar, spruce and silver fir. *The alpine zone* extends from the upper limit of the temperate zone to about 4500 m or higher. The characteristic trees of this area are silver fir, silver birch and junipers.

Andaman region comprises the islands of Andaman and Nicobar. The main types of forests in this region are mangrove forests, beech forests, evergreen, semievergreen and deciduous forests.

Fauna‡

Mammals. The Indian mammalian fauna exhibits a great diversity in form. But certain groups like the duckbill, spiny ant eater, kangaroo, opossum, koala, camel†, giraffe, zebra, hippopotamus, seals and walruses are completely absent in India.

Shrews, moles, hedgehogs, flying lemurs, bats ranging from big fruit-bats with wide wing span to tiny pipistrelles, monkeys, gibbons and langurs form the major group of mammalian animals in India The pangolin (scaly ant-eater) is represented in India by a single family, *manidae*, with a single genus, *manis* and three species.

The higher simian apes like the gorilla, baboon, chimpanzee and orang-utan are not found in India.

Carnivora. Two types of wolf are found in India, the woolly wolf of Western Himalayas, and the small Indian wolf which is seen throughout India. The jackal is the commonest of the *canidai*, being found in almost all villages, near hilly or forest areas. Four species of fox and several races of the Indian wild dog are found in jungle areas.

The sloth bear or the common black bear is found throughout India, and the snow, red or brown bear and the great Asiatic black bear in the Western Himalayas.

There is only a single species of panda, but 18 species of martens, weasels and others. Civets (civet cats), linsangs and mongooses of which there are 18 species are found all over India. The Indian or striped hyena is the only species of the family in India and is found in almost all the forests.

There are four species of panthers, the common leopard found all over India, the all-black and albino leopards, both of which are aberrations but are often found and the snow leopard seen only in the Himalayas.

The *tiger* is the monarch of almost all Indian forests and very often a terror-striking animal, especially when it turns maneater as it sometimes does.

The Board of Wild Life has recently declared Tiger as the national animal of India and a special project called 'Project Tiger' has been launched by the government to protect this fast-dwindling species (see *Wild Life*, infra).

Asiatic lion, once rampant in north India, disappeared towards the end of the 19th century, leaving barely a dozen head in the Gir forest in Kathiawar in 1880. Since then, the stringent protective measures adopted by the government have increased the lion population.

India has different varieties of cats.

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‡ See *Wild Life* infra.

† Domesticated one-humped camels are used in north-western India as draught animals.

the Indian desert cat, the common jungle cat, the leopard cat and the fishing cat. The lynx is found in Kashmir while the caracal is found in northwestern India. The clouded leopard, a rare species, is found only in the Himalayas. The cheetah or the hunting leopard, one of the fastest runners known, has practically disappeared from India.

Herbivora. The Indian elephants rule the forests of peninsular India. Being quite intelligent and amenable to training, they are caught and used for hauling logs from inaccessible forests. They are also used in India for ceremonial purposes.

The great Indian one-horned *rhinoceros* was on the verge of extinction when the government stepped in and provided sanctuaries for them.

Horses are not indigenous to India, and of asses, only a single species is found. Two species of pigs are found, the wild boar and the pygmy hog. Mousedeer, spotted deer, barking deer and sambar are found all over India. The musk deer is confined to Kashmir. The Kashmir stag or hangul, once abundant, is now a disappearing family. It is now a protected animal. The four-horned antelope, black buck, and Indian gazelle are common all over India. The Indian buffalo in wild state is found in Nepal, Assam and Madhya Pradesh, while the Asiatic ibex is confined to the Himalayas. The nilgai or the blue bull is a large animal which is a pest to crops and ranges all over India, except Bengal and the West Coast.

Gaur, wrongly called Indian bison, is the tallest and the most handsome of the world's wild oxen. They are a special attraction in Bandipur and Mudumalai sanctuaries in the south.

Reptiles. Only three species of crocodiles exist in India—the *gharial* found in a few rivers like the Indus, Ganga, Mahanadi and Brahmaputra, the *marsh crocodile* which is found all over India and the *estuarine crocodile*, that inhabits the mouths of rivers and canals near the sea. Alligators are not found in India. About 50 species of *turtles, tortoise and terrapins* are known in India. Lizards of four types and snakes of many families appear in India. Among the common snakes of India are the rat-snake, the common wolf-snake and grass-snake.

The Indian python is the biggest Indian snake going up to some 20 feet in length and weighing around 200 lbs. It is a beautiful snake, which is found everywhere in India, in the high forests, humid low-lying swamps and the arid thorn-bush scrub jungles.

Among the deadly poisonous snakes are the *krait* of which there are eleven species, *cobra*, of which there are two varieties, the *common cobra* and the *king cobra* or Hamadrayed which grows up to about 4 to 5 metres. The *vipers* are represented by over 20 species, the commonest among them being *Russels viper, saw-scaled viper* and *pit-viper*.

Birds. It is estimated that there are 1200 species of birds in India, which work out at about 14 per cent of the world total of 8600. Together with their sub-species or geographical races, the Indian forms reach a total of 2061. Of these about 1750 are resident in India and the rest migratory.

Indian peacock with blue plumage has been declared the National Bird and is now a protected species.

93. CLIMATE AND RAINFALL

The latitudinal spread of the country and the altitudinal differences prevailing from area to area, have combined to create various climatic zones in the country. Parts of North India, for example, lying below the Himalayas have strong winters and hot summers, while the south generally has no winters at all. Allowing for such deviations, the climate of India may be broadly described as the tropical monsoon type. (See Flora and Fauna-supra)

Temperature. Naturally enough, hill stations, coastal areas and plateau regions have differing temperature conditions. Hill stations like Darjeeling and Simla have the lowest temperatures, with an average temperature between 15.7° and 16.9°C. In coastal areas, Bombay on the west coast has an average temperature of 30.5°C, while Madras, on the east coast, goes up to 33.4°C. In the plateau, Dehra Dun records an average of

27.5°C while Nagpur registers an average of 35.5°C, the highest average in all India

Seasons. The Indian Meteorological Department recognises four seasons:

(1) Cold weather season (Dec.-March),
(2) Hot weather season (April-May),
(3) Rainy season (June-Sept.) and
(4) Season of retreating south west monsoon (Oct.-Nov.)

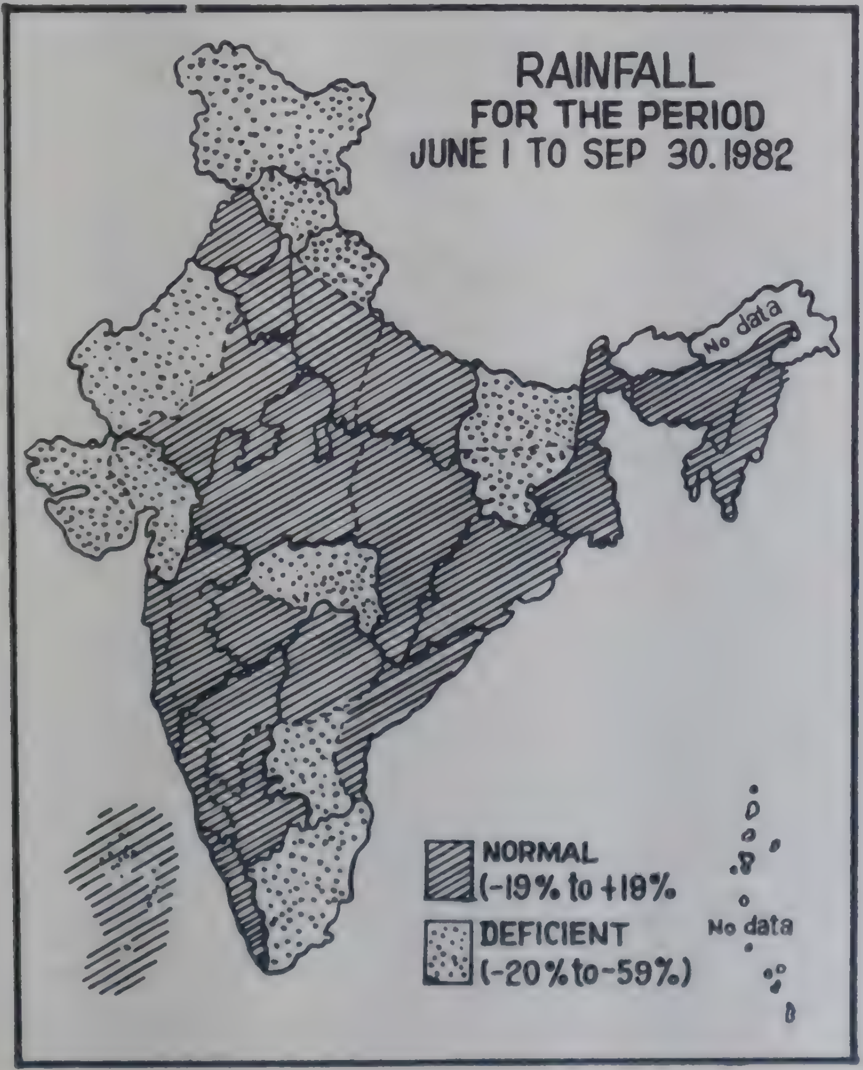
Rainfall. In India, rainfall is erratic and ill distributed. It varies from palce to place and from year to year. Areas like the West Coast, Bengal and Assam get the heaviest rainfall, with more than 80 inches annually. Places like Bombay, M. Pradesh and Bihar receive 40 to 80 inches rainfall. Madras, north-western Deccan and upper Gangetic plain have 20 to 40 inches rainfall. The Rajasthan desert and the high Ladakh plateau of Kashmir receive only nominal rainfall, a mere four inches annually. At the other extreme, Cherapunji in Meghalaya gets as much as 425 inches rainfall, the highest in all India.

A more important feature of Indian rainfall is that it is not evenly distributed all through the year, as in some other countries, England for example.

Rainfall Pattern in India and Britain

Percentage of Annual Rainfall

Period	*India*	*Britain*
June to Sept.	73.7	32.2
Oct. to Dec.	13.3	30.4
Jan. to Feb.	2.6	17.5
Mar. to May	10.4	19.9
Total	100	100



Seasonwise Distribution (India)

Rainfall season	*Duration*	*Approximate Percentage of the annual rainfall*
South-west monsoon	June-Sept.	73.7
Post-monsoon	Oct.-Dec.	13.3
Winter or north-east monsoon	Jan.-Feb.	2.6
Pre-monsoon	Mar.-May	10.4
	Total	100

The Monsoons. India is fed by two rainbearing periods, the Southewest monsoon and the Northeast monsoon. The southwest monsoon is the dominant monsoon in India. The northeast comes in the wake of the southwest and is comparatively a minor monsoon. It is confined to a smaller area of the country. Its duration is much shorter and its rains less copious. But for some parts of the country, particularly Tamil Nadu, the Northeast is the major monsoon.

The Southwest monsoon opens on the west coast of India about the beginning of June. There is no set date for the onset of the monsoon. It may come in the middle of May (1918) or the middle of June (1915) or any date in between. The date is important for two reasons. First, it is the green signal for agricultural operations. Second, it is only the monsoon rains that can relieve the scorching summer heat.

By May the hot season in India reaches its hottest. Heat waves sweep across the whole of north India and much of the south coming as far down as Madras. Sunstroke deaths in varying numbers in north and central India are an annual phenomenon.

Premonsoon showers. Before the monsoon opens in full force in June, there are intermittent rains in April-May, known as pre-monsoon showers. These are crucial to cultivation as they are the first signals to start agricultural operations.

94. THE PEOPLE

Evolution. The people of India are largely the descendants of immigrants from across the Himalayas. It is still a moot point whether any native race evolved on Indian soil. We know that the species known as *Ramapithecus* were found in the Siwalik foothills of the north-western Himalayas. This species believed to be the first in the line of *hominids* (human family) lived some 14 million years ago. Recent researches have shown that a species resembling the *Australopithecus* lived in India some 2 million years ago. Even this discovery leaves an evolutionary gap of as much as 12 million years since Ramapithecus,

This classification is outdated (see *Ethnology Part I).* The fact is that the Indian population is polygenetic and is a confusing mixture of various racial strains. Few, if any, can claim to belong to any particular stock. Nevertheless, many Indians pride themselves on their Aryan descent. The observations of Natwar Singh, diplomat-historian are relevant in this context. Says Singh, "The unpalatable truth is, that for a vast number of people in North India, immaculate ancestry is a mirage. He is a brave man, who can with certitude prove his Aryan or Scythian descent. He that has traced his birth to a mythological ancestor, has done so, to draw attention away from the intervening generations."* We are giving below descriptions of the various races in India according to the classical pattern.

Ethnic Composition. According to Dr. B.S. Guha, the population of India is derived from 6 main ethnic groups: 1. Negrito, 2. Proto-Australoids or Austrics, 3. Mongoloids, 4. Mediterranean or Dravidian, 5. Western Brachycephals and 6. Nordic Aryans.

Negritos. Brachycephalic (broad-headed) Negroids from Africa were the oldest people to have come to India. These people are now found only in patches among the hill tribes of South India (Irulas, Kodars, Paniyans and Kurumbas) on the mainland. But they survive in the Andaman Islands, where they have retained their language† They are an inconsequential element in the population of India.

Proto-Australoids or Austrics. They were a race of people, with wavy hair plentifully distributed over their brown bodies, long heads with low foreheads and prominent eye-ridges, noses with low and broad roots, thick jaws, large palates and teeth and small chins.

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* K. Natwar Singh, *Maharaj Suraj Mahal* (1707-1763).

† see Andaman & Nocobar Islands, infra.

The Austrics of India represent a race of medium height, dark (and in some cases black) complexion with long heads and rather flat noses but otherwise regular features. Miscegenation with the earlier Negroids may be the reason for the dark or black pigmentation of the skin and flat noses. Austric tribes spread over the whole of India and then passed on to Burma, Malaya and the islands of South East Asia. "The Austrics form the bedrock of the people."†

The Austrics laid the foundation of Indian civilization. They cultivated rice and vegetables and made sugar from sugarcane. Their language has survived in the Kol or Munda speech, current in Eastern and Central India.

‡**Dravidians** comprise all the three sub-types, Paleo-Mediterranean, the true Mediterranean and Oriental Mediterranean. They appear to be people of the same stock as the peoples of Asia Minor and Crete and the pre-Hellenic Aegeans of Greece. They are reputed to have built up the city civilization of the Indus Valley, whose remains have been found at Mohenjodaro and Harappa and other Indus cities. The Dravidians must have spread to the whole of India, supplanting Austrics and Negritos alike.

Mongoloids of various types are confined to the north-eastern fringes of India, in Assam, Nagaland, Mizo, Garo and Jainti Hills. Generally, they are people of yellow complexion, oblique eyes, high cheek-bones, sparse hair and medium height.

Nordic Aryans who migrated to India were a branch of Indo-Iranians, who had originally left their homes in Central Asia, some 5000 years ago, and had settled in Mesopotamia for some centuries. The Aryans must have come into India between 2000 and 1500 B.C. Their first home in India was western and northern Punjab, from where they spread to the Valley of the Ganga and beyond. The Aryans, coming into India, encountered the highly civilized Indus Valley people who had big towns, with fortifications and brick structures and many of the amenities of a quite high city civilization. The Indus people were essentially a city people while the Aryans were a pastoral race.

Though it is not exactly known what happened to the Indus people or their civilisation, it may be assumed that they intermingled with the incoming Aryans, who adopted the Indus culture as their own.

95. POPULATION

India & the World. Although India accounts for only 2.4% of the total world area (world=135.89 million sq. km. India=3.28 million sq. km), it contains about 15% of the world population. The other top countries in point of population are: China 21.72%, U.S.S.R. 6.05% and U.S.A. 5.04%. India is thus the second most populous country in the world, and with China, U.S.S.R. and U.S.A. accounts for nearly 50% (48.34) of the world population.

1981 Census

The first census, that had an all-India character, was taken in 1872. It was, however, a patchwork of census data taken in various parts of the country. The first regular census in India was taken in 1881. Thereafter, there have been regular censuses every 10 years. The 1981 census is the 12th census of India and the 4th since independence.

Provisional Figures

The population of India, as at sunrise on 1st March, 1981, was as follows: *Total No: 683,810,051, Males: 353,347,249, Females: 330,462,802*. These figures include the projected populations for Assam and Jammu & Kashmir. In Assam "the census could not unfortunately be carried out synchronously", while in Jammu & Kashmir census operations were postponed owing to climatic conditions.

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† Gazetteer of India.

‡ The term **Dravidian** is derived from the pre-Hellenic Lycians of Asia Minor who called themselves **Trmmili**, which the Greeks wrote as **Termilai**. **Termilai** became **Dramiza**. **Dramiza** evolved itself in two ways: (1) in the South among the Dravidians, the process was: **dramiza—damiz—Tamiz** (modern Tamil). (2) In the north, among the Aryans, **dramiza— dramila—dravida** (Dravidian)

The provisional figures labour under two handicaps:—

1) There is always an element of under-enumeration in massive operations of this kind. In 1971 it was found that the percentage of under-enumeration was 1.67. Applying this rate to the 1981 provisional total, the population of India will work out at about 695.23 million as against a provisional total of 683.81 million.

2) The Registrar-General has noted that the total figure of 684 million includes the projected figures for Assam and Jammu & Kashmir. The projections as a whole are seen to have fallen short of the provisional figure by about 12 million. So it is obvious that the projections for Assam and Jammu & Kashmir are under-estimates. It remains to be seen how far short they are. In other words, the actual populations of Assam and Jammu & Kashmir are likely to be much higher than the projections. This would also contribute to enhancing the total population in the final analysis.

Table 67

Provisional Population Totals
A Comparative Picture

	Total Population				*Density of population 1981 (per sq. km.)*
India / State / Union Territory	*Population in 1971 (and rank)*	*Population in 1981 (and rank)*	*Decennial growth rate (percentage) 1961-71*	*1971-81*	
INDIA	548159652	683810051	+24.80	+24.75	221†
States					
Andhra Pradesh	43502708 (5)	53403619 (5)	+20.90	+22.76	194
Assam*	14625152(13)	19902826(13)	+34.95	+36.09	254
Bihar	56353369 (2)	69823154 (2)	+21.33	+23.90	402
Gujarat	26697475 (9)	33960905(10)	+29.39	+27.21	173
Haryana	10036808(15)	12850902(15)	+32.23	+28.04	291
Himachal Pradesh	3460434(18)	4237569(18)	+23.04	+22.46	76
Jammu & Kashmir*	4616632(16)	5981600(17)	+29.65	+29.57	NA
Karnataka	29299014 (8)	37043451 (8)	+24.22	+26.43	193
Kerala	21347375(12)	25403217(12)	+26.29	+19.00	654
Madhya Pradesh	42654119 (6)	52131717 (6)	+28.67	+25.15	118
Maharashtra	50412235 (3)	62693898 (3)	+27.45	+24.36	204
Manipur	1072753(20)	1433691(20)	+37.53	+33.65	64
Meghalaya	1011699(21)	1327874(21)	+31.50	+31.25	59
Nagaland	516449(23)	773281(23)	+39.88	+49.73	47
Orissa	21944615(11)	26272054(11)	+25.05	+19.72	169
Punjab	13551060(14)	16669755(14)	+21.70	+23.01	331
Rajasthan	25765806(10)	34102912 (9)	+27.83	+32.36	100
Sikkim	209843(28)	315682(28)	+29.38	+50.44	44
Tamil Nadu	41199168 (7)	48297456 (7)	+22.30	+17.23	371
Tripura	1556342(19)	2060189(19)	+36.28	+32.37	196
Uttar Pradesh	88341144 (1)	110858019 (1)	+19.78	+25.49	377
West Bengal	44312011 (4)	54485560 (4)	+26.87	+22.96	614
Union Territories					
Andaman and Nicobar Islands	115133(29)	188254(29)	+81.17	+63.51	23
Arunachal Pradesh	467511(25)	628050(24)	+38.91	+34.34	7
Chandigarh	257251(27)	450061(27)	+114.59	+74.95	3948
Dadra&Nagar Haveli	74170(30)	103677(30)	+27.96	+39.78	211
Delhi	4065698(17)	6196414(16)	+52.93	+52.41	4178
Goa, Daman & Diu	857771(22)	1082117(22)	+36.88	+26.15	284
Lakshadweep	31810(31)	40237(31)	+31.95	+26.49	1257
Mizoram	332390(26)	487774(26)	+24.93	+46.75	23
Pondicherry	471707(24)	604136(25)	+27.81	+28.07	1228

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† While working out the density of India, Jammu and Kashmir has been excluded as comparable figures of area and population are not available. * Projected figures for 1981.

Rank by Size of Population

The following table indicates the ranking of the States by population size in 1981 and 1971 and the percentage contribution in terms of population of each of the states. Uttar Pradesh continues to dominate the scene and retains its first position. Most of the other states have continued to retain their original ranks. However, Rajasthan has stolen a march over Gujarat and has moved up from the 10th place in 1971 to the 9th place in 1981 while Gujarat has moved from the 9th place in 1971 to the 10th place in 1981. Delhi which was 17th in rank in 1971 has overtaken Jammu and Kashmir and moved to 16th place while Jammu and Kashmir has moved from 16th place in 1971 to the 17th place in 1981. Similarly, Pondicherry and Arunachal Pradesh which were 24th and 25th in rank in 1971 have exchanged ranks in 1981.

Table 68

Ranking of States/Union Territories by Population

Rank in 1981	States/Union Territories in order of population size	Population 1981	Percentage to total population of India 1981	Rank in 1971
	INDIA	683810051	100.00	
1	UP	110858019	16.21	1
2	Bihar	69823154	10.21	2
3	Maharashtra	62693898	9.17	3
4	West Bengal	54485560	7.97	4
5	AP	53403619	7.81	5
6	MP	52131717	7.62	6
7	Tamil Nadu	48297456	7.06	7
8	Karnataka	37043451	5.42	8
9	Rajasthan	34102912	4.99	10
10	Gujarat	33960905	4.97	9
11	Orissa	26272054	3.84	11
12	Kerala	25403217	3.71	12
13	Assam	19902826	2.91	13
14	Punjab	16669755	2.44	14
15	Haryana	12850902	1.88	15
16	Delhi	6196414	0.91	17
17	J & K	5981600	0.87	16
18	HP	4237569	0.62	18
19	Tripura	2060189	0.30	19
20	Manipur	1433691	0.21	20
21	Meghalaya	1327874	0.19	21
22	Goa, Daman & Diu	1082117	0.16	22
23	Nagaland	773281	0.11	23
24	Arunachal Pradesh	628050	0.09	25
25	Pondicherry	604136	0.09	24
26	Mizoram	487774	0.07	26
27	Chandigarh	450061	0.06	27
28	Sikkim	315682	0.05	28
29	Andaman and Nicobar Islands	188254	0.03	29
30	Dadra & Nagar Haveli	03677	0.02	30
31	Lakshadweep	40237	0.01	31

Uttar Pradesh, Bihar and Madhya Pradesh together account for 34.05 per cent of the population or more than one-third of the population of India is in these three states.

96. GROWTH OF POPULATION

Except for a slight fall in 1911-21, the population of India has been steadily growing for the last 80 years (1901-1981). From 1951 onwards, the growth rate has been very high. In absolute terms, India's population has increased by 136 million in the decade 1971-81. This increase is 13 million more than the addition to the total population over the 50 years from 1901 to 1951.

Absolute Increase. All the states and Union Territories have had an increase in population but at different rates, and except for a few areas, the addition in numbers between 1971 and 1981 is higher than that between 1961-71. It is only in the states of Kerala, Orissa, Tamil Nadu and in the Union Territory of Goa, Daman & Diu that the absolute increase in the decade 1971-81 is lower than that in the former decade. The decadal growth rates in these three states of Kerala, Orissa and Tamil Nadu have been much lower than in the other States. The absolute increase in the decade 1971-1981, as compared with that during 1961-71 is particularly noticeable in the case of Bihar, Rajasthan and Uttar Pradesh. This is important in demographic terms.

Percentage Growth

While there is doubtless an absolute increase in most cases, it will be noticed that in quite a few states the percentage decadal growth rate in the decade

1971-81 has been lower than that in the decade 1961-71. This is so in the case of Gujarat, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Tamil Nadu, Tripura, West Bengal and in the Union Territories of Andaman and Nicobar Islands, Arunachal Pradesh, Chandigarh, Delhi, goa, Daman & Diu and Lakshadweep. The decadal growth rate in the decade 1971-81 has been higher than the corresponding rate of the previous decade 1961-71 only in the states of Andhra Pradesh, Bihar, Karnataka, Nagaland, Punjab, Rajasthan, Sikkim, Uttar Pradesh and in the Union Territories of Dadra & Nagar Haveli and Mizoram.

Table 69

Absolute increase and per cent growth rate

1961-71 and 1971-81

Sl. No.	*India / State / Union Territory*	*Decadal Growth of Population* 1961-71	1971-81	*Percentage decadal Growth Rate* 1961-71	1971-81
	INDIA	108924881	135650399	+24.80	+24.75
	States				
1	Andhra Pradesh	7519261	9900911	+20.90	+22.76
2	Assam	3787823	5277674	+34.95	+36.09
3	Bihar	9905912	13469785	+21.33	+23.90
4	Gujarat	6064125	7263430	+29.39	+27.21
5	Haryana	2446265	2814094	+32.23	+28.04
6	Himachal Pradesh	647971	777135	+23.04	+22.46
7	Jammu and Kashmir	1055656	1364968	+29.65	+29.57
8	Karnataka	5712242	7744437	+24.22	+26.43
9	Kerala	4443660	4055842	+26.29	+19.00
10	Madhya Pradesh	9281711	10477598	+28.67	+25.15
11	Maharashtra	10858517	12281663	+27.45	+24.36
12	Manipur	292716	360938	+37.53	+33.65
13	Meghalaya	242319	316175	+31.50	+31.25
14	Nagaland	147249	256832	+39.88	+49.73
15	Orissa	4395769	4327439	+25.05	+19.72
16	Punjab	2415991	3118695	+21.70	+23.01
17	Rajasthan	5610204	8337106	+27.83	+32.36
18	Sikkim	47654	105839	+29.38	+50.44
19	Tamil Nadu	7512215	7098288	+22.30	+17.23
20	Tripura	414337	503847	+36.28	+32.37
21	Uttar Pradesh	14586590	22516875	+19.78	+25.49
22	West Bengal	9385732	10173549	+26.87	+22.96
	Union Territories				
1	Andaman and Nicobar Islands	51585	73121	+81.17	+63.51
2	Arunachal Pradesh	130953	160539	+38.91	+34.34
3	Chandigarh	137370	192810	+114.59	+74.95
4	Dadra & Nagar Haveli	16207	29507	+27.96	+39.78
5	Delhi	1407086	2130716	+52.93	+52.41
6	Goa, Daman & Diu	231104	224346	+36.88	+26.15
7	Lakshadweep	7702	8427	+31.95	+26.49
8	Mizoram	66327	155384	+24.93	+46.75
9	Pondicherry	102628	132429	+27.81	+28.07

97. DENSITY

Density of population as revealed by the provisional figures of 1981 has been indicated in the Table 70. *A Comparative Picture.* The highest densities in the country, with over 1000 persons to the sq. km, are shown by 4 Union Territories, namely Delhi (4178), Chandigarh (3948), Lakshadweep (1257) and Pondicherry (1228). Delhi and Chandigarh are cities with peripheral rural areas. Lakshadweep and Pondicherry are comparatively small in area. There is not much point in comparing their densities with those of States. However, among the rest of the Territories and all the States, Kerala reports the highest density with 654 persons to the sq. km followed by West Bengal with 614.

Table 70

States and Union Territories (In descending order of density) 1981 and 1971

Rank	*State/Union Territory*	*Density of population per sq. km.*	
		1981	*1971*
1	Delhi	4178	2742
2	Chandigarh	3948	2257
3	Lakshadweep	1257	994
4	Pondicherry	1228	959
5	Kerala	654	549
6	West Bengal	614	499
7	Bihar	402	324
8	Uttar Pradesh	377	300
9	Tamil Nadu	371	317
10	Punjab	331	269
11	Haryana	291	227
12	Goa, Daman & Diu	284	225
13	Assam	254	186
14	Dadra & Nagar Haveli	211	151
15	Maharashtra	204	164
16	Tripura	196	148
17	Andhra Pradesh	194	158
18	Karnataka	193	153
19	Gujarat	173	136
20	Orissa	169	141
21	Madhya Pradesh	118	94
22	Rajasthan	100	75
23	Himachal Pradesh	76	62
24	Manipur	64	48
25	Meghalaya	59	45
26	Nagaland	47	31
27	Sikkim	44	30
28	Andaman & Nicobar Islands	23	14
29	Mizoram	23	16
30	Arunachal Pradesh	7	6

98. SEX RATIO

The sex ratio is defined as the number of females per 1000 males in the population.

Table 71

Sex Ratio 1901—1981

Census Year	*Sex Ratio*
1901	972
1911	964
1921	955
1931	950
1941	945
1951	946
1961	941
1971	930
1981	935

The sex ratio has been generally adverse to women, i.e., the number of women per thousand men has generally been less than 1000. Apart from the fact that the sex ratio is adverse to women, it will also be noticed that the sex ratio has deteriorated over the decades. However, there is an apparent improvement in the sex ratio between 1971 and 1981. The reason for the disparity in the sex ratio and the steady deterioration in the sex ratio are not quite clear. Explanations have been offered that there is a preference for male children resulting in neglect of female babies, that certain types of mortality are selective between males and females and that some part of the adverse sex ratio may be attributable to high maternal mortality. There is little evidence to support the view that there is a deliberate neglect of female babies despite the fact that there may be a preference for male children. This is an area of uncertainty and requires further investigation

It will be noticed that Kerala has the highest sex ratio of 1034 and is a solitary exception. In all the other States and Union Territories the sex ratio is adverse to women

It is interesting to notice that certain States have had a fairly extended period where the sex ratio has been over one thousand, i.e. the sex ratio has been in favour of females. In the case of Kerala, the sex ratio has been throughout above 1000, while in Manipur, Orissa, Tamil Nadu, Goa, Daman & Diu, Lakshadweep and Mizoram it has been above 1000 for a considerable part of the period 1901 to 1981. On the other hand, the sex ratio has been constantly on the low side in comparison with other States and Union Territories in Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Tripura, Andaman and Nicobar Islands, Chandigarh and Delhi. At this stage one would be reluctant to offer specific reasons for this phenomenon and this is an area, as mentioned earlier, of uncertainty which would merit more detailed consideration on the basis of further information.

Table 72

Sex Ratio—States and Union Territories (In descending order) 1981

Rank	*State/Union Territory*		*Sex Ratio*
	INDIA	...	935
1	Kerala	...	1034
2	Himachal Pradesh		988
3	Pondicherry		985
4	Orissa		982
5	Goa, Daman & Diu		981
6	Tamil Nadu		978
7	Lakshadweep		976
8	Andhra Pradesh		975
9	Dadra & Nagar Haveli		974
10	Manipur		972
11	Karnataka		963
12	Meghalaya		956
13	Jammu & Kashmir		953
14	Tripura		948
15	Bihar		947
16	Gujarat		942
17	Madhya Pradesh		941
18	Maharashtra		939
19	Mizoram		936
20	Rajasthan		921
21	West Bengal		911
22	Assam		900
23	Uttar Pradesh		886
24	Punjab		886
25	Haryana		877
26	Arunachal Pradesh		870
27	Nagaland		867
28	Sikkim		836
29	Delhi		810
30	Chandigarh		770
31	Andaman and Nicobar Islands		761

99. LITERACY

One of the important characteristics on which information is obtained in the census is literacy. For the purposes of the census, a person is deemed literate if he or she can read and write with understanding in any language. A person who can merely read but cannot write is not defined as literate. Children below five years of age were treated as illiterate

Literacy rates would be more meaningful if one were to exclude the population in the age group 0-4 from total population. However, at this stage, this information is not available since it would only be generated through further tabulations. Therefore, for practical purposes the entire population is being taken into account including the population in the age group 0-4. The Table below presents the figures for the country at each census year. In working out the rates for 1981, the population of Assam and Jammu and Kashmir have been excluded as the census has not yet been taken there. The rates upto 1941 are for undivided India.

Table 73

Literacy 1901-1981

Year	*Persons*	*Males*	*Females*
1901	5.35	9.83	0.60
1911	5.92	10.56	1.05
1921	7.16	12.21	1.81
1931	9.50	15.59	2.93
1941	16.10	24.90	7.30
1951	16.67	24.95	7.93
1961	24.02	34.44	12.95
1971	29.45	39.45	18.69
1981	36.17	46.74	24.88

Literacy Progress in Absolute Numbers

One of the ironies in the Indian literacy situation is that while the percentage of literacy has been increasing every decade, the total number of illiterates has also been increasing. As between 1971 and 1981 the percentage has increased by nearly 7%. While this increase is reflected in the increase of literates by about 82 million the illiterates have also increased by 48 million as the following figures show:

	Literates	*Illiterates*
1971	156,440,275	372,145,203
1981	237,991,932	419,933,693

Table 74

States/Union Territories

(Literacy ranking in 1981 and 1971)

Ranking in 1981	*State/ Union Territory*	*Literacy rate 1981*	*Literacy rate 1971*	*Ranking in 1971*	*Percentage increase of literacy*
1	Kerala	69.17	60.42	2	14.48
2	Chandigarh	64.68	61.56	1	5.07
3	Delhi	61.06	55.61	3	9.80
4	Mizoram	59.50	53.79	4	10.90
5	Goa, Daman & Diu	55.86	44.75	6	24.83
6	Lakshadweep	54.72	43.66	7	25.33
7	Pondicherry	54.23	46.02	5	17.84
8	Andaman & Nicobar Islands	51.27	43.59	8	17.62
9	Maharashtra	47.37	39.18	10	20.90
10	Tamil Nadu	45.78	39.46	9	16.02
11	Gujarat	43.75	35.79	11	22.24
12	Manipur	41 99	32.91	14	27.59
13	Nagaland	41·99	27·40	9	53·25
14	Himachal Pradesh	41.94	31.96	15	31.23
15	Tripura	41.58	30.98	17	34.22
16	West Bengal	40.88	33.20	13	23.13
17	Punjab	40.74	33.67	12	21.00
18	Karnataka	38.41	31.52	16	21.86
19	Haryana	35.84	26.89	20	33.28
20	Orissa	34.12	26.18	21	30.33
21	Sikkim	33.83	17.74	27	90.70
-22	Meghalaya	33.22	29.49	18	12.65
23	Andhra Pradesh	20.94	24.57	22	21.86
24	Madhya Pradesh	27.82	22.14	23	25.65
25	Uttar Pradesh	27.38	21.70	24	26.18
26	Dadra & Nagar Haveli	26.60	14.97	28	77.69
27	Bihar	26.01	19.94	25	30.44
28	Rajasthan	24.05	19.07	26	26.11
29	Arunachal Pradesh	20.09	11.29	29	77.95

FEMALE LITERACY

Female literacy is of special importance in the Indian context because of the great disparity in male and female literacy rates. In 1901 there were 1466 male literates for every 100 female literates. By 1931 the disparity had been brought down to 560 males as against 100 females. Since 1950 the difference has been steadily whittled down bringing the ratio to 201 males for 100 females in 1981.

Table 75

Progress of Female Literacy 1901-1981

Year	*Number of literates*		*Literate males per 100 literate females*
	Males	*Females*	
1901	11870758	809580	1466
1911	13552737	1298484	1043
1921	15690428	2221499	1208
1931	22274035	3977034	560
1941	NA	NA	NA
1951	46272335	13916683	332
1961	77906038	27565962	283
1971	112012994	49423270	227
1981	158837215*	79154717*	201

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* Excludes Assam and Jammu and Kashmir. NA' stands for not available.

Table 76

States & Union Territories by ranges of female literacy

State/Union Territory	*Per cent female literates*	*Percentage increase of fem. literacy 1971-81*
Female Literacy 50% and above		
Kerala	64.48	18.73
Chandigarh	59.30	9.11
Mizoram	52.57	12,55
Delhi	52.56	10.07
Female Literacy 25%—50%		
Goa, Daman & Diu	46.78	33.31
Pondicherry	44.30	27.96
Lakshadweep	44.21	44.67
Andaman and Nicobar Islands	41.85	34.52
Maharashtra	35.08	32.73
Punjab	34.14	31.81
Tamil Nadu	34.12	27.03

Nagaland	33.72	80.80
Gujarat	32.31	30.55
Tripura	31.60	49.13
Himachal Pradesh	31.39	55.17
Manipur	30.69	57.14
West Bengal	30.33	35.28
Meghalaya	29.28	19.22
Karnataka	27 83	32.71
Female Literacy less than 25%		
Haryana	22.23	49.29
Sikkim	22.07	147.98
Orissa	21.11	51.65
Andhra Pradesh	20.52	30.29
Dadra & Nagar Haveli	16.75	113.65
Madhya Pradesh	15.54	42.31
Uttar Pradesh	14.42	36.68
Bihar	13.58	55.73
Rajasthan	11.32	33.81
Arunachal Pradesh	11.02	197.04

100. MAJOR RELIGIOUS COMMUNITIES

The major religious communities of India are the *Hindus*, *Muslims*, *Christians*, *Sikhs*, *Buddhists*, *Jains* and *Zoroastrians*. Buddhists, Jains and Zoroastrians are numerically insignificant but they are important in other ways and are therefore treated as major communities.

Hindus account for 82.72 per cent of the total population of India or 453 million (453,292,086). They form the preponderant majority (60% and above) in most of the States and Territories.*

The Scheduled Castes and Tribes who are part of the Hindu community form over 21% of the total population of India as under: Scheduled Castes 14.63%, Scheduled Tribes 6.93%. The Scheduled Castes number 79 million (79,995,896) and the Scheduled Tribes 38 million (38,015,162).

Muslims numbering 61 million (61,417,934) form the second biggest community in India, but comprise only 11.21 per cent of the total population.

Christians who number 14 million (14,223,382) are the third biggest community, although they make up only 2.60 per cent of the total population. The southern states of Kerala, Tamil Nadu and Andhra Pradesh together account for more than 60 per cent of the Christians.

Sikhs numbering 10 million (10,378,797) form 1.89 per cent of the total population. They are concentrated largely in the Punjab where they constitute 60.22 per cent of the population.

Buddhists numbering 3 million (3,812,315 form only 0.73 per cent of the total population. Maharashtra accounts for over 85 per cent of the total Buddhist population of the country, though it forms only 6.47 per cent of the population of the state. In Arunachal Pradesh 13.3 per cent of the population are Buddhists.

Jains numbering 2 million (2,604,646) make up 0.47 per cent of the population. They are spread largely in the western part of the country, viz. Maharashtra, Rajasthan and Gujarat.

Zoroastrians who number below a million (91,266) have been included under 'Other Religions & Persuasions' in the main Census tables. They are concentrated in Bombay where they total 72,266.

Table 77

Percentage Distribution of Population by Religions 1971 (India)

Total population	...	100.00
Hindus	...	82.72
Muslims	...	11.21
Christians	...	2.60
Sikhs	...	1.89
Buddhists	...	0.70
Jains	...	0.47
Other religions and persuasions		0.40
Religion not stated	...	0.01

Source: Registrar General and Census Commissioner, India.

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* States & Territories as in 1971.

101. LANGUAGE FAMILIES

Babel of Tongues

India is a land of myriad tongues. The 1961 census listed 1652 languages as the mother tongues spoken in India. The 1971 census has reproduced the list.* This Babel of tongues has been built up through the ages by the various races that came into India from time immemorial—Negroids, Austrics, Sino-Tibetans, Dravidians, Aryans and a host of others who came after them.

Thus the Indian languages of today have evolved from different language families corresponding more or less to the different ethnic elements that have come into India from the dawn of history. They may be grouped into 6 groups as under: 1. Negroid, 2. Austric, 3. Sino-Tibetan, 4. Dravidian, 5. Indo-Aryan and 6. Other Speeches.

These languages have interacted on one another through the centuries and have produced the major linguistic divisions of modern India. Among the major groups, the Aryan and the Dravidian are the dominating families. They have influenced each other and have, in turn, been influenced by the Austric and Sino-Tibetan tongues. It is easy to spot Sino-Tibetan and Austric borrowings in the Aryan and Dravidian languages and mutual borrowings of the Aryan and Dravidian groups.

1. Negroid Family

The earliest inhabitants of India are supposed to be Negroids. They have lost their language on the mainland of India, but have retained it in the Andaman Islands. The Negroid language surviving in the Andamans, is conveniently called *Andamanese*. It is spoken by about 1000 people

2. Indo-Aryan Family

Indo-Aryan, the Indic branch of the Indo-European family, came into India with the Aryans. It is the biggest of the language groups in India, accounting for about 74 per cent of the entire Indian population.

The important languages in this group are:

(i) Western Punjabi which is spoken in the western districts of Punjab.

(ii) Sindhi, originally spoken in Sind (now in Pakistan), is now found in Western and Central India.

(iii) Eastern Punjabi, spoken in and near Lahore (Pakistan) and Amritsar (India), may be treated as the standard form of the old Indo-Aryan language. This is written mostly in the Gurumukhi script, but Muslims show a preference for the Persian script and Hindus for the Nagari script.

(iv) Hindi or Hindustani is now loosely used to describe all languages and dialects current in India to the east of Punjab and Sind, north of Gujarat and Maharashtra, west of Orissa and Bengal and south of Nepal. Strictly Hindi is limited to a narrower circle which involves two major divisions—Eastern and Western Hindi. **Eastern Hindi** or Kosali has 3 dialects: (1) *Awadhi* or *Baiswari* (the language of the great mediaeval poet Thulasidas), (2) *Begheli* and (3) *Chattisgarhi*. **Western Hindi** dialects include *Kharibolí Hindi* (Delhi), *Bangaru*, *Brajbhasha*, *Kanauji* and *Bundeli*

Hindi or Hindustani has produced two great literatures, *Urdu* and (High) *Hindi*. Both have the same grammar and the same basic vocabulary. They differ, however, in script and higher vocabulary. **Urdu** uses the Perso-Arabic script. **Hindi** uses the Nagari script and has a preference for purely Indian words, in contradistinction to the numerous Arabic and Persian words borrowed by Urdu.

(v) Bihari is a name collectively applied to three dialects prevalent in and around Bihar—*Maithili*, *Magadhi* and *Bhojpuri*. These dialects cover some 16 million speakers. The official language of Bihar is Hindi in the standard Khariboli form.

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* 1971 census regarded many of the 1961 entries as spurious or calling for further investigation. Such remarks apply mostly to languages whose speakers were numerically insignificant, ranging below 10 and coming down to as few as 1 in many cases. The authenticity or otherwise of such entries is of little import. It does not radically alter the broad picture

Source: Language Handbook on Mother tongues in the Census (1971).

(vi) Rajasthani is a name adopted by Grierson to indicate a group of languages in and around Rajasthan. The important languages in this group are *Marwari, Malvi, Dhundari, Nimadi, Haranti* and *Banjari*. Marwari spoken at Jodhpur has a good literature. It is Marwari, which often passes for Rajasthani. The state language of Rajasthan is Hindi.

(vii) Gujarati, the state language of Gujarat, is allied to western Hindi and has a well-developed literature.

(viii) Marathi, the state language of Maharashtra, is a rich language with a literature that goes back to the 12th century.

(ix) Assamese, the state language of Assam, has developed through centuries of fusion with other languages. Though Aryan in origin, Assamese has been greatly influenced by speeches of the Austric and Sino-Tibetan families.

(x) Bengali, the state language of West Bengal in India, has a highly developed literature, one of the most advanced in the world.

(xi) Oriya is the state language of Orissa. Though an archaic language it has a quite extensive literature.

(xii) Pahari group consists of Himalayan dialects.

(xiii) Kashmiri belongs to the Dardic branch of the Indo-European family and not to the Indic branch.

(xiv) Sanskrit, the classical language of India, represents the highest achievement of the Indo-Aryan languages. Although hardly spoken now-a-days, Sanskrit has been listed a nationally accepted language in the VIII Schedule to the Constitution.

3. Dravidian Family

Dravidian languages form a group by themselves, and unlike the Aryan, Austric or Sino-Tibetan speeches, have no relations outside the Indian subcontinent, that is, India, Pakistan and Bangladesh. The Dravidian family is the second largest group in India, covering about 25% of the total Indian population.

The Dravidian language came into India centuries before the Indo-Aryan. It split into three branches in the Indian subcontinent—(i) The northern branch comprised *Brahui* spoken in Baluchistan and *Kurukh* and *Malto* spoken in Bengal and Orissa. (ii) The central branch was composed of *Telugu* and a number of dialects spoken in Central India—*Kui, Khond, Holani, Konda, Gondi, Naiki, Parji, Koya* and others. (iii) The southern branch was made up of *Tamil, Kannada, Malayalam, Tulu, Badaga, Toda, Kota* and *Kodagu*.

The outstanding languages of the Dravidian group are: (i) **Telugu,** the state language of Andhra Pradesh, numerically the biggest of the Dravidian languages. (ii) **Tamil,** the state language of Tamil Nadu apparently the oldest and the purest branch of the Dravidian family. (iii) **Kannada,** the state language of Karnataka, another ancient Dravidian language that has developed individually. (iv) **Malayalam,** the state language of Kerala, the smallest and the youngest of the Dravidian family.

4. Austro-Asiatic Family

The Austro-Asiatic family is a numerically minor language group, which commands around 6 million speakers, or 1.5% of the total Indian population. This family is represented in India by two branches. (i) Munda (ii) Monkhmer. **Munda or Kol** languages are spoken by the hill tribes in Bihar, Chota Nagpur, Orissa and Central India. **Monkhmer** speeches include the *Khasi* group of languages in North-eastern India and *Nicobarese* of the Nicobar Islands.

The Austric languages have never been written down and consequently have no alphabets of their own.

5. Sino-Tibetan Family

The Sino-Tibetan family spreads over a vast area, in the north east, which is mountainous and sparsely populated. The Sino-Tibetan speakers, all told, come to a little over 3 million and form only 0.73% of the Indian population.

Sino-Tibetan family is represented in India by two branches: (i) *Thai-Chinese* and (ii) *Tibeto-Burman*. The Thai-Chinese branch has only one representative in India, *Khamti*.

The Tibeto-Burman family is well represented by a number of languages.

- (i) **Bhotia** group
- (ii) **Bodo** group
- (iii) **Naga** group
- (iv) **Kuki-Chin** group including Manipuri
- (v) **Abor** group

Manipuri, the state language of Manipur is the only important language in the Tibeto-Burman family. It has a fairly good literature.

6. Other Speeches

Although the overwhelming majority of Indian speeches are traceable to the Aryan; Dravidian, Austric and Sino-Tibetan families there are a number of spoken languages in India which show no affinity to any of the four major linguistic groups. The *Nahali*, for instance, a dialect spoken in Central India, is obviously a remnant of some other language, that must have come into India at an unknown era in Indian history. It has not yet been identified.

7. Immigrant Communities

Some communities, long settled in India, have adopted Indian languages as their mother tongues. The *Parsees*, for instance, speak Gujarati. The *Beni Israel* Jews of Maharashtra have given up their original Arabic in favour of the local language, Marathi.

Box 35

Syrian Christians

The Gazetteer of India considers the Syrian Christians an immigrant community who had discarded their native Syrian in favour of the language of their domicile—Malayalam. This is a misinterpretation. Of course, there is a small section of Syrian Christians who claim that they are descended from the original Syrian settlers in Kerala. But the great majority of the Syrian Christians do not make any such claim. On the other hand, they pride themselves in being the descendants of Indians who were converted to Christianity by St. Thomas the Apostle in the first century A.D. From the earliest times, the Syrian community on the west coast of India was in communion with the Christian churches in the Middle East from whom they derived their Syrian liturgy. This is why they were called Syrian Christians and not because they were Syrian immigrants.

102. PRINCIPAL LANGUAGES

Mother Tongues

Mother tongue has been defined by the 1971 census as the language spoken in childhood by the person's mother to the person or mainly spoken in the household. It is, in other words, what may be called the *home language*.

Of the 1652 mother tongues listed in the census, 33 were spoken by people numbering over a lakh. The following table shows the names of mother tongues and the number of speakers.

Table 78*

Mother Tongue (name)	*Speakers (number)*
Hindi	153,729,062
Telugu	44,707,697
Bengali	44,521,533
Marathi	41,723 93
Tamil	37,592,794
Urdu	28,600,428
Gujarati	25,656,274
Malayalam	21,917,430
Kannada	21,575,019
Oriya	19,726,745
Bhojpuri	14,340,564
Punjabi	13,900,202
Assamese	8,958,977
Chhattisgarhi	6,693,445
Magahi/Magadhi	6,638,495
Maithili	6,121,922
Marwari	4,714,094
Santali	3,693,558
Kashmiri	2,421,760
Rajasthani	2,093,557
Gondi	1,548,070

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* The figures are provisional and indicative rather than absolute

Konkani ...	1.522.684
Dogri ...	1,298.855
Gorkhali/Nepali ...	1,286.824
Garhwali ...	1,227.151
Pahari ...	1,269.651
Bhili/Bhilodi ...	1,250,312
Kurukh/Oraon ...	1,240.395
Kumauni ...	1,234.939
Sindhi ...	1,204.678
Lamani/Lambadi ...	1,203.338
Tulu ...	1,156.950
Bagri	1 055.607

Source: Language Handbook

A Common Language

India never had a common language which was intelligible to the masses everywhere in India For many years. Sanskrit remained a common medium But it was the language of the learned classes and not of the masses. Under the British. English became a sort of lingua franca. Here again. it was restricted to the educated few

With independence. the question of a common language naturally came up The Constituent Assembly could not arrive at a consensus in the matter The question was put to vote and Hindi won on a single vote—the casting vote of the President.‡ Hindi. however. was only one of the many regional languages of India The Indian National Congress had advocated the formation of linguistic provinces. The acceptance of this policy involved the statutory recognition of all the major regional languages

The Constitution therefore recognised Hindi in Devanagari script as the official language of the Union (art. 343 et seq.) and the regional languages as the official languages of the States concerned (art 345 et seq). English was recognised as the authoritative legislative and judicial language (art 348 et seq.). A schedule—the 8th Schedule—was added to the Constitution to indicate all regional languages statutorily recognised. The Schedule now contains 15 languages as follows:

(1) Assamese (2) Bengali (3) Gujarati (4) Hindi (5) Kannada (6) Kashmiri (7) Malayalam (8) Marathi (9) Oriya (10) Punjabi (11) Sanskrit (12) Tamil (13) Telugu (14) Urdu (15) Sindhi.

Of the 15 languages listed in the schedule. all except three—Sanskrit. Kashmiri and Sindhi—are official languages of the various States.

1. Assamese

Assamese. an Indo-Aryan language. is the official language of Assam State More than 57 per cent of the population of Assam speak Assamese.

Assamese has developed as a literary language from the 13th century.

2. Bengali

Bengali. one of the leading Indo-Aryan languages. is the official language of West Bengal. It is spoken by 86 million people. the majority of whom are now in Bangladesh. formerly East Pakistan

Bengali emerged as a separate language around A.D 1000. It is now one of the most advanced languages of India

3. Gujarati

Gujarati. a member of the Indo-Aryan family. is the official language of the State of Gujarat

Gujarati started out as an independent language around A.D. 1200 It has progressed at a rapid pace and is now one of the most developed Indian languages.

4. Hindi

Hindi. numerically the biggest of the Indo-Aryan family. is the official language of the Government of India. According to the 1961 census. Hindi was returned by a total of 133 5 million speakers. This is exclusive of Bihari. Rajasthani. Urdu and Pahari languages. which would add up to another 60 million. bringing up the Hindi-speaking population. close on to 200 million.

Among the various dialects of Hindi. the dialect chosen as official Hindi is the standard *Kharboli.* written in Devanagari script. This speech was originally spoken in Delhi and some wester UP districts.

From the literary point of view. the term Hindi covers not only the Kharibolí form. but also a number of other dialects like Brajbhasha. Bundeli. Awadhi. early Marwari of Rajasthan and the Maithili and Bhojpuri speeches of Bihar

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‡ Ordinarily when there is a tie between two groups in a meeting and the President is called upon to exercise his casting vote. he votes for the status quo. Here it was the other way round

Hindi, in the standard Khariboli form, is a late-comer on the Indian linguistic scene. It started developing only in the second half of the 19th century. To-day, being the official language of six States and the Indian Union, Hindi is receiving high patronage. This patronage and support has encouraged the development of Hindi as a great literary language.

5. Kannada

Kannada, the official language of the state of Karnataka, belongs to the Dravidian family. The majority of its speakers is found in Karnataka where they form more than 65 percent of the population.

Kannada, as an independent language, dates from the 9th century. It has rich literary traditions.

6. Kashmiri

Kashmiri, a language of the Indo-Aryan group, is often mistaken as the state language of Jammu and Kashmir. Actually, Urdu is the state language of Jammu and Kashmir.

Kashmiri-speaking population in Jammu and Kashmir comes to about 55 percent of the total population.

Kashmiri literature goes back to A.D. 1200. It is comparatively a developed language. It is written, at present, in the Perso-Arabic script.

7. Malayalam

Malayalam, a branch of the Dravidian family, is the official language of the State of Kerala. Malayalam struck out on its own by the 10th century A.D. It is one of the most developed languages of India.

8. Marathi

Marathi, belonging to the Indo-Aryan stock, is the official language of Maharashtra

Though Marathi separated from the main Indo-Aryan stock at a very early date, its literary career began only in the 13th century. Since then, it has made wonderful progress. It has today a fully developed literature of the modern type.

9. Oriya

Oriya, a branch of the Indo-Aryan family, is the official language of the State of Orissa, where Oriya-speaking population comprises some 82 per cent of the population.

Oriya is found recorded as far back as the 10th century. But its literary career began only in the 14th century.

10. Punjabi

Punjabi belongs to the Indo-Aryan family and is the official language of the State of Punjab.

Punjabi, though a very ancient language, turned literary only in the 15th century. From the 19th century, Punjabi showed vigorous development in all branches of literature. It is written in the Gurumukhi* script.

11. Sanskrit

Sanskrit, the classical language of India, is also one of the oldest languages of the world—perhaps the very oldest to be recorded. It starts with Rig Veda, which appears to have been composed around 2000 B.C. Early Sanskrit is known as Vedic Sanskrit and covers the period between 2000 and 500 B.C. Classical Sanskrit covers the period between 500 B.C. and A.D. 1000.

The contributions of Sanskrit to Indian culture and literature are immeasurably vast and profound. As R.C. Nigam‡ observes, "In the long sweep of its history, although without any chronological documentation, Sanskrit has set forth intensive literary activity, both in quantity as well as in quality, in almost all departments of letters—literature, philosophy, arts and science, even though a considerable lot of it still continues in the form of manuscripts and a good deal appears to have been lost"

12. Sindhi

Sindhi is a branch of the Indo-Aryan family. It is spoken by some 7 million people, of whom 5½ million live in Sind (Pakistan), and the rest mostly in India.

Sindhi has preserved some of the archaic features of the old Indo-Aryan language. Sindhi uses the Perso-Arabic script in Pakistan. Speakers in India use the Devanagari script

Sindhi has not developed any worthwhile literature

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* 'Gurumukhi' literally means 'from the face of the guru'. It is the name given to the script devised by the Sikh guru, Guru Angad, in the 16th century The Gurumukhi is based on the old Sharda script, which is related to the Nagari script

‡ Asst. Registrar General Census, 1971

13. Tamil

Tamil, the oldest of the Dravidian languages, is the state language of Tamil Nadu. Tamil literature goes back to centuries before the Christian era. "In originality, though not in extent, Tamil literature stands by itself". It represents certain new literary types which are not found in Sanskrit or other Aryan languages. The language is spoken by 30 million or more and judging by its modern publications, it is advancing at a fantastic pace.

14. Telugu

Telugu, numerically the biggest of the Dravidian languages, is the state language of Andhra Pradesh. It is the biggest linguistic unit in India, next to Hindi. Telugu is found recorded from the 7th century A.D. But it ws only in the 11th century that it broke out into a literary language.

15. Urdu

Urdu, the state language of Jammu and Kashmir, is spoken by more than 23 million people in India (1961 census)

The name Urdu is derived from *'Zaban-e-Urdu-Muala'* which means the language of the exalted camp or court. The exalted camp or court here meant the camp or court of the ruling Sultans of Delhi.

Urdu and Hindi have proceeded from the same source, that is, from the Khariboli speech of Delhi and surrounding areas. The Khariboli was a spoken language which prevailed around Delhi, since the 13th century. The Sultans of Delhi found it necessary to make use of the local vernacular for purposes of administration. In course of time, a synthesis was effected between Persian (the official language of the Sultanate) and Khariboli speech of the native population. Thus, Khariboli, the spoken vernacular, was transformed into a written language, by the use of Persian characters. By the 18th century, this hybrid language became the language of the people at court.

In the 19th century, when the Delhi Sultanate disappeared and the British became the rulers, Sir Sayyed Ahmed Khan (1817—1898) started a revival of Urdu, as the language of the Muslims in India. Modern Urdu was thus born.

Urdu has produced an extensive literature. Muslim speakers of Urdu use the Perso-Arabic script while Hindus use the Devanagari script. Urdu is also written in Roman characters.

Official Languages

Art. 343 of the Constitution provided that for a period of 15 years from the commencement of the Constitution the English language shall continue to be used for all official purposes of the Union. It was expected that after the expiry of the stipulated period (that is after 1965) Hindi will displace English as the official language of the Union.

Subsequent developments have turned the current in favour of continuing English as an additional official language, no definite date being fixed for its elimination and replacement by Hindi.

As matters stand, the languages listed in the Constitution remain the official languages in the respective States, while Hindi and English continue to be used for inter-State correspondence and for all-India use generally.

103. THE CONSTITUTION OF INDIA

Making of the Constitution. The Constitution of India was drawn up by a Constituent Assembly which was initially summoned on Dec. 9, 1946 as a Constituent Assembly for undivided India. With the partition of India in June 1947, the delegates of the Pakistan areas ceased to be members of the Constituent Assembly. On August 14, 1947, the Constituent Assembly met again as the Sovereign Constituent Assembly for the Dominion of India under the Presidentship of Sachidananda Sinha. On the demise of Sinha, Dr. Rajendra Prasad became the President of the Assembly. A draft Constitution was published in February 1948. The Constitution was finally adopted on 26th Nov. 1949. It came into effect on 26th Jan. 1950.

Basic Features. The Indian Constitution closely follows the British Parliamentary model but differs from it in one important respect. In Britain, the Parliament is supreme. No court can question the validity of any law passed by the British Parliament. In India the Constitution is supreme, not the Parliament. So the

Indian courts are vested with the authority to adjudicate on the constitutionality of any law passed by Parliament.

This position, otherwise clear, was complicated by the action of the Constituent Assembly itself. Having promulgated the Constitution, the Constituent Assembly converted itself into the first Indian Parliament. Thus the creator of the constitution, the Constituent Assembly, became the creature of the constitution, the Parliament. In the very second year of promulgating the constitution, the first Parliament set about amending it. This was the *First (Constitution) Amendment Act, 1951*. This amendment planted the seeds of future trouble between Parliament and Judiciary. It clearly showed that the Parliament possessed both constituent and legislative powers. Subsequent Parliaments naturally claimed plenary powers to amend the constitution, in any manner they thought fit.

The powers claimed by Parliament, on the one hand, and the rights vested in the Judiciary, on the other, were bound to clash in the long run. And so they did. The conflict at first centred round specific provisions of law passed by Parliament. When any such provision was declared unconstitutional, the laws were either amended to suit the constitution or the constitution was amended to suit the laws. Such a course naturally precipitated the question whether Parliament possessed unlimited powers to amend the constitution.

The question came up in the Keshavananda Bharati case (1973) where the Supreme Court ruled that the power of amendment vested in the Parliament under Art. 368 (relating to amendment of the constitution) cannot be so exercised as to alter or destroy the basic structure of the constitution. If Parliament had the power to destroy the basic structure of the constitution, it would cease to be a creature of the constitution and become its master.

The question came up again in the Minerva Mills case, after the 42nd amendment was passed. The 42nd amendment effected a constitutional revolution, whereby Parliament overthrew the supremacy of the constitution and made itself supreme in its stead. The first question before the court was whether the Parliament had unbounded powers to amend the constitution.

The Supreme Court delivered its judgement in the Minerva Mills case on May 9, 1980. The court held that the Parliament cannot expand its amending powers under Art. 368, so as to abrogate the constitution or to destroy its essential features. Their Lordships observed, "The donee of a limited power cannot by exercise of that power convert the limited power into an unlimited power". The avowed purpose of the 42nd amendment was to remove doubts. "But", said the Court, "after the decision of this court in Keshavananda Bharati case, there could be no doubt as regards the limitations of Parliament's power to amend the constitution. The new clause (5) of Art. 368 confers on the Parliament an undefined power to amend the constitution, even so as to distort it out of recognition....No constituent power can conceivably go higher than the skyhigh power conferred by clause (5), for, it even empowers the Parliament to repeal provisions of the constitution, that is to say, destroy democracy and substitute for it a totally antithetic form of government."

Another question before the Court was whether the Parliament had the power to bar the jurisdiction of the court to enquire into the constitutional validity of laws. On this question the court ruled that "Our constitution is founded on a nice balance of power among the three wings of the State, namely the Executive, the Legislature and the Judiciary. It is the function of Judges, nay their duty, to pronounce upon the validity of laws." "Human dignity" (sic), the court observed, "has not yet devised a system by which the liberty of the people can be protected, except through the intervention of courts of law". Again, "The conferment of the right to destroy the identity of the constitution, coupled with the provision that no court of law shall pronounce upon the validity of such destruction, seems to us a transparent case of transgression of the limitations on the amending power".

A third question which the court had to consider was the precedence of Directive Principles over Fundamental Rights. This question was first projected by the 25th amendment. This amendment gave precedence to two clauses of Directive Principles as against Fundamental Rights. They were

Art. 39(b) which related to the ownership and control of the material resources of the community and Art. 39(c) which concerned the question of concentration of wealth in a few hands to the detriment of the community. The court conceded the application of the principle to the two clauses in question. In the 42nd amendment, this precedence was extended to all the Directive Principles. The court objected to this extension and ruled that "to destroy the guarantees given by Part III (Fundamental Rights) in order purportedly to achieve the goals of Part IV (Directive Principles) is plainly to subvert the constitution by destroying its basic structure."

So far only the three points mentioned above have been identified as Basic Features of the constitution. What the other basic features (if any) are remains to be elucidated.

Outline of the Constitution

The Constitution consists of the following: 1. The Preamble. 2. Parts I to XXII covering Articles 1 to 395. 3. Schedules 1 to 10* and 4. An appendix†.

The Preamble. The Preamble declares India a sovereign *Socialist Secular* Democratic Republic and lays down the primary objects of the constitution, namely, to seccure to all citizens justice, social, economic and political, liberty of thought, expression, belief, faith and worship, equality of status and opportunity and fraternity assuring the dignity of the individual and the unity and the integrity of the nation.

The words *'socialist, secular' and 'the unity and the integrity of the nation* were added by the 42nd Amendment.

Structure. India, that is Bharat, shall be a Union of States (Art. 1). The States and Territories thereof shall be as specified in the First Schedule (Art. 2).

Distribution of Powers. The Union has exclusive power to make laws on all matters in List I of the Seventh Schedule (Union List). The States have exclusive power to make laws on all matters in List II (State List). The Union and States have concurrent powers to legislate on any matter enumerated in List III (Concurrent List) (Art. 246).

Residuary Powers. The Union has exclusive power to make laws on any matter not enumerated in the Concurrent List or State List (Art. 248).

Over-riding Powers. In case of any conflict between Union laws and State laws, the Union laws shall prevail (Art. 254)

Citizenship. Citizenship rights are given to every person who is born in India or either of his parents was born in India or who has been a resident of India for 5 years, immediately preceding the commencement of the Constitution.

The Constitution of India commenced on the 26th January 1950

Fundamental Rights

Seven Fundamental Rights are granted to citizens under Arts. 12 to 35 of the Constitution (Part III). They are: 1. Right to Equality, 2. Right to Freedom, 3. Right against exploitation, 4. Right to freedom of Religion, 5. Cultural and Educational Rights, 6. Right to Property and 7. Right to constitutional Remedies, that is to say, all citizens are guaranteed the right to move the Supreme Court or the High Courts by appropriate proceedings for the enforcement of Fundamental Rights.

The 16th and 24th Amendments have considerably limited the exercise of Fundamental Rights. Two, in particular, (the Right to Freedom and the Right to Property) have been reduced to names by the 1st, 4th and 24th amendments. The State is empowered to pass laws imposing reasonable restrictions on the exercise of these two rights.

Directive Principles

The Directive principles of state policy are contained in Arts. 36 to 51 of the Constitution (Part IV). These lay down 19 objectives covering a wide range of subjects, which the State shall endeavour to achieve. These are not enforceable at law like Fundamental Rights. Nevertheless, they are declared fundamental to the governance of the country.

Subsequent amendments starting with the 25th have attempted to give precedence to Directive Principles over

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* Schedule 10 was omitted by the 36th Amendment

† Appendix contains the order extending the application of the constitution to Jammu & Kashmir.

Fundamental Rights. The 25th amendment restricted such precedence to two objectives, contained in cl. (b) and (c) of Art. 39. They relate to the equitable distribution of material resources and the concentration of wealth in the hands of a few to the detriment of many. These, it may be noticed, were already secured by the amendments to Fundamental Rights which empowered the State to impose reasonable restrictions to the right to property. The 42nd amendment sought to extend this precedence to all objectives specified in Directive Principles. This provision was struck down by the Supreme Court (see supra).

The President. There shall be a President of India (Art. 52) who is the Executive head of State (Art. 53—(1) and the Supreme Commander of the Armed forces—Art. 53(2). The President shall be elected from an electoral college consisting of (a) the elected members of both Houses of Parliament and (b) the elected members of the Legislative Assemblies of the States (Art. 54). The President shall hold office for five years—Art. 56(1). and is eligible for reelection (Art. 57).

The Vice-President. The Vice-President shall be elected by the members of an electoral college consisting of the members of both houses of Parliament—Art. 66 (1). The Vice-President may hold office for five years (Art. 67), and shall be the ex-officio Chairman of the Council of States (Art. 64).

Council of Ministers. There shall be a Council of Ministers with the Prime Minister at the head to aid and advise the President in the exercise of his functions—(Art. 74(1). The Prime Minister shall be appointed by the President, and the other Ministers shall be appointed by the President, on the advice of the Prime Minister—Art. 75(1). The Ministers shall hold office during the pleasure of the President—Art.75(2). The Council of Ministers (as at present constituted) consists of the Prime Minister and (1) Ministers who are members of the cabinet, (2) Ministers of State (Union Ministers) who are not members of the cabinet and Deputy Ministers.

Administrative Ogranisation. A Secretary to Government is the administrative head of a ministry and the principal adviser of the minister. When the volume of work in a ministry exceeds the manageable charge of a Secretary, one or more wings may be established under a Joint Secretary. A ministry is divided into divisions, branches and sections functioning under Deputy Secretaries. Under Secretaries and Section Officers respectively.

The Parliament. There shall be a Parliament for the Union, which shall consist of the President and two Houses, the Council of States (Rajya Sabha) and the House of the People (Lok Sabha)—Art. 79.

The Council of States shall consist of not more than 238 elected representatives of States and Union Territories and 12 members to be nominated by the President (Art. 80). The House of People shall consist of not more than 500 members chosen by direct election from territorial constituencies in States and not more than 25 members to represent Union Territories. (Art. 81).

The Council of States shall not be subject to dissolution but as nearly as possible one-third of its members shall retire, as soon as may be, after the expiry of 2 years. The House of the People shall continue for 5 years (unless sooner dissolved) from the date of its first meeting and no longer and the expiry of the said period of five years shall operate as dissolution of the House (Art. 83). This mandatory provision of dissolution may be extended for a year due to emergency.

Parliamentary Committees. The following committees are appointed to assist the Parliament in its deliberations. 1. Public Accounts Committee, 2. Estimate Committee, 3. Public Undertakings Committee, 4. Committee on Government Assurances.

Separation of Powers. In a presidential system of government like that of the USA, the three branches of government—the Legislature, the Executive and the Judiciary—are independent units. But in a Parliamentary system like that of India the Executive is subordinate to the Legislature. The Judiciary alone functions as an independent branch.

Supreme Court of India

Chapter IV Part IV of the Constitution

deals with judiciary. There shall be a Supreme Court of India, consisting of a Chief Justice of India and other Judges, Art. 124(1). The parliament has the power to increase the number of judges. A judge of the Supreme Court is to be appointed by the President after consultation with the Chief Justice of the Supreme Court shall hold office until the age of sixty-five and can be removed from office by the President, only after an address by each house of Parliament supported by more than two-thirds majority of members present and voting.

The Supreme Court has both original and appellate jurisdiction. The original jurisdiction is limited to questions between the Government of India and the States, or between the States inter se and to such other questions which involve "the existence or the extent of a legal right" (Art. 131). The Appellate Jurisdiction extends over all the High Courts in India (Art. 132).

The Attorney General. The President shall appoint a person who is qualified to be appointed as a judge of the Supreme Court, to advise the Government of India on legal matters (Art. 76). He has the right to speak and otherwise to take part in the proceedings of either House and to be a member of any Parliamentary Committee but is not entitled to vote (Art. 88).

The Comptroller General. There shall be a Comptroller and Auditor General of India who shall be appointed by the President. He shall only be removed from office in like manner and on the like grounds as a Judge of the Supreme Court (Art. 148) (1). He exercises a general control over the accounts of the Union and State governments (Art. 149). He is not eligible for further office either in the Union or State governments, once he has retired [(Art. 148(4)].

The Election Commission is to supervise and control all matters relating to elections in the Parliament and State Assemblies and to the offices of the President and Vice-President (Art. 324). The Election Commission may consist of the Chief Election Commissioner and such other Election Commissioners as the President may appoint from time to time. When any other Election Commissioner is appointed, the Chief Election Commissioner shall function as the Chairman of the Election Commission. The Chief Election Commissioner cannot be removed from office except in the same manner and on the same grounds as a judge of the Supreme Court (Art. 324).

State Governments

The system of Government in States closely follows the pattern of the Union Government. The expression 'State' does not include the State of Jammu and Kashmir, unless otherwise indicated (Art. 152).

The Governor of a State is the Executive head of the State government (Arts. 155 and 156). He is assisted by a Council of Ministers, with the Chief Minister at the head (Art. 163). The Chief Minister is to be appointed by the Governor and other Ministers are to be appointed on the advice of the Chief Minister.

The Legislature of a State shall consist of the Governor and one or two houses of legislature, as the case may be (Art. 108). The following States have two Houses, the Legislative Council (Vidhan Parishad) and the Legislative Assembly (Vidhan Sabha): Andhra Pradesh, Bihar, Madhya Pradesh, Tamil Nadu, Maharashtra, Karnataka and UP. The Legislative Assembly of a State may consist of not more than 500 and not less than 60 members (Art. 170). The total number of memebrs in the Legislative Council, if any, shall not exceed one-third of the total number of memebrs in the Assembly (Art. 171).

There shall be a High Court for each State, consisting of a Chief Justice and such other judges as the President may appoint (Art. 214 and 216). A judge of the High Court can be removed from office by the President, in the same manner as he may remove a judge of the Supreme Court (Art. 217). The High Courts have original jurisdiction in such matters as writs and appellate jurisdiction over all subordinate courts in their jurisdiction.

Advocate General. Every State shall have an Advocate General to advise the government on legal matters (Art. 165).

Union Territories

The Union Territories ordinarily have no Council of Ministers or legislatures of their own. But the Parliament may bylaw create for any of the Union Territories of Goa, Daman & Diu, Pondicherry and Mizoram a body whether elected or partly elected and partly nominated to function as a legislature for the Union Territory or a Council of Ministers or both (Art. 239A).

Official Language. Article 343 of the Constitution provides that the official language of the Union shall be Hindi in the Devanagari script and the form of numerals for official purposes, shall be the international form of Indian numerals: in other words, the Arabic numerals. English, which was originally to continue as the official language only upto Jan. 26, 1965, will under the Official Languages Act, 1963 continue to be used even after that date in addition to Hindi.

Amendment. Art. 368 deals with amendment of the Constitution. A Bill for Amendment must be passed in each House by a majority of the total membership of that House and by a majority of not less than two-thirds of the members present and voting.

Amendments to certain parts of the Constitution, however, require ratification of the Legislatures of not less than one-half of the States by resolutions to that effect.

SCHEDULES TO THE CONSTITUTION

First Schedule (under Articles 1 and 4) gives a list of the States and Territories comprising the Union.

States: 1. Andhra Pradesh, 2. Assam, 3. Bihar, 4. Gujarat, 5. Kerala, 6. Madhya Pradesh, 7. Tamil Nadu, 8. Maharashtra, 9. Karnataka, 10. Orissa, 11. Punjab, 12. Rajasthan, 13. Uttar Pradesh, 14. West Bengal, 15. Jammu and Kashmir, 16. Nagaland, 17. Haryana, 18. Himachal Pradesh, 19. Manipur, 20. Tripura, 21. Meghalaya, 22. Sikkim.

Union Territories: 1. Delhi, 2. Andaman and Nicobar Islands, 3. Laccadive, Minicoy and Amindivi Islands*, 4. Dadra and Nagar Haveli, 5. Goa, Daman and Diu, 6. Pondicherry, 7. Chandigarh, 8. Mizoram, 9. Arunachal Pradesh.

Second Schedule [under Arts. 59 (3), 65 (3), 75 (6), 97, 125, 148 (3), 158 (3)] consists of 5 Parts **A** to **E**.

Part A fixes the remuneration and emoluments payable to the President and Governors. The following emoluments per mensem shall be paid to the President: Rs. 10,000. Governor of state: Rs. 5500. The President and the Governors of the States shall also be paid such allowances as were payable respectively to the Governor General of India and the Governors of the corresponding provinces immediately before the commencement of this Constitution. **Part B** has been deleted by the Constitution (Seventh Amendment) Act of 1956. **Part C** contains provisions as to the Speaker and the Deputy Spkeaker of the House of the People and the Chairman and the Deputy Chairman of the Council of States and the Speaker of the Legislative Assembly and the Chairman and the Deputy Chairman of the Legislative Council. **Part D** contains provisions as to emoluments of the judges of the Supreme Court and of the High Courts. Chief Justice of the Supreme Court per mensem Rs. 5000. Any other judge of the Supreme Court per mensem Rs. 4000. Chief Justice of High Courts per mensem Rs. 4000. Any other judge of High Courts per mensem Rs. 3500. **Part E** contains provisons as to the Comptroller and Auditor General of India. Pay per mensem Rs. 4000.

Third Schedule (under Arts. 75 (4), 99, 124 (6), 148 (2), 164 (3), 188 and 219) contains forms of *Oaths and Affirmations.*

Fourth Schedule [under Arts. 4 (1) and 80 (2)] allocates seats for each State and Union Territory, in the Council of States.

Fifth Schedule [under Art. 244 (1)] provides for the administration and control of Scheduled Areas. This schedule provides for amendment by a simple majority of Parliament and takes it out of the ambit of Art. 368 (Amendment of the Constitution).

Sixth Schedule [under Arts. 214 (2) and 275 (1)] provides for the administration of Tribal Areas in Assam, Meghalaya and Mizoram. This is a lengthy schedule which goes into the details of the administration in the Tribal Areas concerned. This schedule can also be amended by a simple majority of Parliament.

Seventh Schedule (under Art. 246) gives three Lists: **1. Union List** contains

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* Now named Lakshadweep.

97 subjects in which the Union government has exclusive authority **2. State List** contains 66 subjects which are under the exclusive authority of State government. **3. Concurrent List** contains 47 subjects, where the Union and States have concurrent powers

Eighth Schedule [under Arts. 344 (1) and 351 (1)] gives a list of 15 languages recognised by the constitution: 1. Assamese, 2. Bengali, 3. Gujarati, 4. Hindi, 5. Kannada, 6. Kashmiri, 7. Malayalam, 8. Marathi 9. Oriya, 10. Punjabi, 11. Sanskrit, 12. Sindhi, 13. Tamil, 14. Telugu, 15. Urdu.

Ninth Schedule [under Art. 31 (B)] was added by the Constitution (First Amendment) Act 1951. It contains Acts and orders relating to land tenures, land tax, railways, industries etc. passed by the State governments, and the Union government which are beyond the jurisdiction of civil courts.

The relevant Art. 31 (B) reads as follows: "None of the Acts and Regulations specified in the Ninth Schedule, nor any of provisions thereof shall be deemed to be void or ever to have become void on the ground that such Act, Regulation or Provision is inconsistent with or takes away or abridges any of the rights conferred by any provisions of this part and notwithstanding any judgement, decree or order of any court or tribunal to the contrary, each of the said Acts and/or Regulations shall, subject to the power of any competent Legislature to repeal or amend it, continue in force."

Table 79

Jurisdiction and Seats of Higher Judicial Tribunals in India

Supreme Court of India
Jurisdiction—All India
Seat —New Delhi

High Courts

Name	*Year of establishment*	*Territorial Jurisdiction*	*Seat of the Court*
Allahabad	1866	Uttar Pradesh	Allahabad (Bench at Lucknow)
Andhra Pradesh	1954	Andhra Pradesh	Hyderabad
Bombay	1861	Maharashtra and Dadra and Nagar Haveli	Bombay (Bench at Nagpur)
Calcutta	1861	West Bengal and Andaman and Nicobar Islands	Calcutta
Delhi	1966	Delhi	Delhi
Gauhati	1972	Assam, Manipur, Meghalaya, Nagaland, Tripura, Mizoram and Arunachal Pradesh	Gauhati. (Temporary Benches at Imphal, Agartala and Kohima)
Gujarat	1960	Gujarat	Ahmedabad
Himachal Pradesh	1971	Himachal Pradesh	Simla
Jammu and Kashmir	1928	Jammu and Kashmir	Srinagar and Jammu
Karnataka	1884	Karnataka	Bangalore
Kerala	1956	Kerala and Lakshadweep	Ernakulam
Madhya Pradesh	1956	Madhya Pradesh	Jabalpur (Benches at Gwalior and Indore)
Madras	1861	Tamil Nadu & Pondicherry	Madras
Orissa	1948	Orissa	Cuttack
Patna	1916	Bihar	Patna (Bench at Ranchi)
Punjab and Haryana	1947	Punjab Haryana and Chandigarh	Chandigarh
Rajasthan	1949	Rajasthan	Jodhpur (Bench at Jaipur)
Sikkim	1975	Sikkim	Gangtok

104. CONSTITUTION AMENDMENTS

Modes of Amendment. One of the peculiar features of the Indian Constitution is that various parts of it call for various processes of amendment. The methods of amendment are three, according to the subject matter of the Article concerned. 1) Articles that may be amended by a simple majority of Parliament. These are mainly matters of detail like those provided in the Schedules. 2) Articles that may be amended by a two-thirds majority of both houses of Parliament. These are comparatively important matters. 3) Articles that require not only a two-thirds majority of Parliament but also ratification by at least one-half of the State Legislatures. These are specifically mentioned. They are the following: Articles concerning the election of the President (Arts. 54 & 55), the powers of the Union Cabinet (Art. 73), the powers of State Cabinets (Art. 162), the High Courts in Union Territories (Art. 241), the establishment of the Supreme Court (Ch. IV, Part V), Constitution and powers of the High Courts (Ch. V, Part VI), Relations between the Union &State Legislatures (Ch. I, Part XI), the Lists—Union List, State List and Concurrent List—in the Seventh Schedule, the representation of States in Parliament and the provisions of Article 368 itself (Part XX).

Article 368 (Part XX) lays down the general procedure for Amendments. But Articles that require only a simple majority in Parliament do not fall in this category. Such Articles are indicated by a special clause attached to each of them which specifically excludes the operation of Art. 368 (see Art. 21, Sixth Schedule). Amendment of all other Articles comes within the scope of Art. 368.

Amendments. Starting with the First (Constitution) Amendment Act 1951 we have come down to the 46th Amendment in 1982. This works out at an average of 1½ amendments per year. We give below a serial list of Amendments for all the years between 1951 and 1982.

Table 80

Year	*Serial Nos. of Amendments*
1951	1st Amendment
1952	2nd
1954	3rd
1955	4th and 5th
1956	6th and 7th
1959	8th
1960	9th
1961	10th and 11th
1962	12th, 13th and 14th
1963	15th and 16th
1964	17th
1966	18th, 19th and 20th
1967	21st
1969	22nd and 23rd
1971	24th, 25th, 26th and 27th
1972	28th, 29th and 30th
1973	31st and 32nd
1974	33rd, 34th and 35th
1975	36th, 37th, 38th and 39th
1976	40th, 41st and 42nd
1977	43rd
1978	44th
1980	45th
1982	46th

1. Constitution (First Amendment) Act, 1951. The first amendment was made by the Constitution (First Amendment) Act, 1951. Besides making minor changes in Articles 15, 19, 85, 87, 174, 176, 341, 342, 372 and 375 this Act added two new Articles, 31—A and 31—B and a new Schedule, the 9th Schedule.

This amendment has permitted reasonable restrictions to be imposed by law on the exercise of the right of freedom of speech and expression in the interest of friendly relations with foreign States or public order. It has also removed from the scope of judicial review, restrictions imposed on the right of citizens to carry on any trade, business, industry or servic where such restrictions have been imposed with a view to enabling the State to undertake any scheme of nationalisation.

Another clause of the Amendment authorises the State to make special provision for the advancement of any socially and educationally backward class of citizens or for the Scheduled Castes and the Scheduled Tribes.

Two new Articles 31-A and 31-B were inserted. Article 31-A provides that no law providing for the acquisitio by the State of any estate or of any right therein or for the extinguishment o modification of any such rights shall deemed to be void on the ground that it is inconsistent with, or takes away or abridges any of the rights conferred by any provision of this Part III.

Article 31-B provides that none of the Acts and Regulations specified in the Ninth Schedule nor any of the provisions thereof shall be deemed to be void, or even to have become void on the ground that such Act, Regulation or provision is inconsistent with, or takes away or abridges any of the rights conferred by any provisions of Part III and notwithstanding any judgement, decree or order of any court of tribunal to the contrary, each of the said Acts and regulations shall continue in force.

2. Constitution (Second Amendment) Act, 1952, amended Article 81 with a view to readjusting the scale of representation in the House of the People, necessitated by the completion of the 1951 census.

3. Constitution (Third Amendment) Act, 1954, substituted entry 33 of the Concurrent List in the 7th Schedule by a new one including foodstuffs, cattle fodder, raw cotton and jute as additional items whose production and supply can be controlled by the central govt, if found expedient in the public interest.

4.Constitution (Fourth Amendment) Act, 1955. The Amendment provides that when the State compulsorily acquires private property for a public purpose, the scale of compensation prescribed by the authorising legislation could not be called in question in a court. Another clause excludes the temporary taking over of a property by the State, either in public interest or to secure its better management, from the compensation clause. The amendment also operates as a saving clause for State monopolies. Seven new entries were also added to the 9th Schedule.

5. Constitution (Fifth Amendment) Act, 1955, empowers the President to fix a time limit for State Legislatures to express their views on proposed Central laws affecting the area and boundaries etc. of their respective States.

6. Constitution (Sixth Amendment) Act, 1956, added a new entry to the Union List in the Seventh Schedule relating to taxes on the sale and purchase of goods in the course of Inter-State transactions.

7. Constitution (Seventh Amendment) Act, 1956. This act came into force on 1st Nov. 1956. It was passed for the reorganisation of the States. It involved not only the establishment of new States and alterations in State boundaries but also the abolition of the three categories of the States and the classification of certain areas as Union Territories. This led to the amendment of Article 1 and the First Schedule of the Constitution. Among the other important Articles which were affected by this amendment were Article 131 on the original jurisdiction of the Supreme Court, Article 168 providing for bicameral legislature in certain States and Articles 216, 217, 220 and 224 dealing with the High Courts. Two new Articles 340-A and 350-B were added with a view to implementing the recommendations of the States Reorganisation Commission regarding consitutional safeguards for linguistic minorities.

8. Constitution (Eighth Amendment) Act, 1959, extended the special provision relating to reservation of seats for the Scheduled Tribes and representation of Anglo—Indians in the House of the People and Legislative Assemblies of States, for a further period of ten years from Jan. 26, 1960.

9. Constitution (Ninth Amendment) Act, 1960, amended the first Schedule to the Constitution in order to give effect to the transfer of certain territories to Pakistan in pursuance of the agreements entered into between the Governments of India and Pakistan in Sept. 1958.

10. Constitution (Tenth Amendment) Act, 1961, incorporated former Portuguese enclaves of Dadra and Nagar Haveli within India and provided for their administration by the President.

11. Constitution (Eleventh Amendment) Act, 1961, obviated the necessity of a joint meeting of the two Houses of Parliament by forming them into an electoral college for the election of Vice-President. It also amended Art. 71 so as to make it clear that the election of the President or the Vice-President shall not be challenged on the ground of any vacancy, for whatever reason, in the appropriate electoral college.

12. Constitution (Twelfth Amendment) Act, 1962. The Twelfth amendment was passed to include the territories of Goa, Daman & Diu as a Union Territory in the First Schedule to the

Constitution and to empower the President to make regulations for the peace, progress and good government of these areas.

13. Constitution (Thirteenth Amendment) Act, 1962, created Nagaland as the sixteenth State in the Indian Union.

14. Constitution (Fourteenth Amendment) Act, 1962, conferred necessary legislative powers on Parliament to enact laws for the creation of Legislature and Council of Ministers in Union Territories. Former French establishments of Pondicherry, Karaikal, Mahe and Yanam were specified in the Constitution as the Union Territory of Pondicherry.

15. Constitution (Fifteenth Amendment) Act, 1963, was a minor amendment empowering the President of India, in consultation with the Chief Justice of India to make final decisions on the dispute about a High Court Judge's age. It also shortened the procedure for disciplinary action against State employees.

16. Constitution (Sixteenth Amendment) Act, 1963, empowered the State to enact any legislation, imposing reasonable restrictions on the exercise of funadamental rights by citizens, so as to protect the sovereignty and integrity of India.

It also amended the forms of oath, provided in the Third Schedule.

17. Constitution (Seventeenth Amendment) Act, 1964, provided that if the State acquires land under the personal cultivation of the owner and within the ceiling limit, compensation had to be paid at the market value of the property so acquired. The amendment also extended the protection of the 9th Schedule to 64 State land enactments.

18. Constitution (Eighteenth Amendment) Act, 1966, provided for the linguistic reorganisation of the Punjab into a Punjabi-speaking State called Punjab and a Hindi-speaking State called Haryana.

It further provided that the word 'state' in cls. (a) to (e) of Art. 3 includes a Union Territory and clarified that Parliament had the power to form a new State or Union Territory by combining any part of a State or Union Territory with any part of any other State or Territory.

19. Constitution (Nineteenth Amendment) Act, 1966, is a minor amendment clarifying the duties of the Election Commission.

20. Constitution (Twentieth Amendment) Act, 1966, validates the appointment of certain District Judges, irregularly appointed.

21. Constitution (Twenty-first Amendment) Act, 1967, provided for the inclusion of Sindhi in the Eighth Schedule to the Constitution.

22. Constitution (Twenty-second Amendment) Act, 1969, empowered Parliament to carve a new State (Meghalaya) out of Assam.

23. Constitution (Twenty-third Amendment) Act, 1969, provided for the extension of the reservation of seats for Scheduled Castes and Tribes and the nomination of members of the Anglo-Indian community for another 10 years.

24. Constitution (Twenty-fourth Amendment) Act, 1971, affirmed the Parliament's power to amend any part of the Constitution, including Fundamental Rights by amending Articles 368 and 13 of the Constitution. This neutralised the decision in Golaknath case.

A peculiar feature of the Amendment was that the President was bound to give his assent to amending Acts, when they were presented to him, thus making Presidential assent an automatic act.

25. Constitution (Twenty-fifth Amendment) Act, 1971, barred the jurisdiction of courts over acquisition laws in regard to the adequacy-of the amount paid in lieu of take-over. The word "compensation" in thecase of take-over was deleted and the word "amount" substituted.

A new clause provided that if any law was passed to give effect to the Directive Principles contained in clauses (b) and (c) of Article 39 and contained a declaration to that effect, it shall not be questioned on the ground that it takes away or abridges Fundamental Rights or on the ground that it does not give effect to the principles contained in the declaration.

26. Constitution (Twenty-six Amendment) Act, 1971. This Amendment withdrew the recognition given to former rulers of Princely States and abolished the privy purses granted to them.

27. Constitution (Twenty-seventh Amendment) Act, 1971. Under this Amendment two new Union Territories, Mizoram and Arunachal Pradesh, were set up.

28. Constitution (Twenty-eighth Amendment) Act, 1972. The

Amendment deleted Article 314 of the Constitution, which gave protection to the ICS officers' conditions of service and privileges.

29. Constitution (Twenty-ninth Amendment) Act, 1972. This Amendment included the Kerala Land Reforms (Amendment) Act, 1969 and the Kerala Land Reforms (Amendment) Act, 1971, in the Ninth Schedule to the Constitution so as to protect these Acts from judicial review.

30. Constitution (Thirtieth Amendment) Act, 1972. This Amendment curtailed the number of appeals to the Supreme Court. Formerly appeals to the Supreme Court were decided on the basis of the valuation of the subject matter. The Amendment made only such cases which involve a substantial question of law, appealable to the Supreme Court.

31. Constitution (Thirty-first Amendment) Act, 1973, increased the upper limit of elective seats in the Lok Sabha from 525 to 545.

32. Constitution (Thirty-second Amendment) Act, 1973, implemented the 6-point programme for Andhra Pradesh.

33. Constitution (Thirty-third Amendment) Act, 1974, invalidated the acceptance of resignations by members of the State Legislatures and Parliament, which were made under duress or coercion, or any other kind of involuntary resignations.

34. Constitution (Thirty-fourth Amendment) Act, 1974, provided constitutional protection to 20 land reform Acts passed by the various States, by including them in the 9th Schedule to the Constitution.

35. Constitution (Thirty-fifth Amendment) Act, 1974, provided for Associate State status to Sikkim.

36. Constitution (Thirty-sixth Amendment) Act, 1975, made Sikkim a State of the Indian Union—the 22nd State, in fact

37. Constitution (Thirty-seventh Amendment) Act, 1975, provide for a Legislative Assembly and a Council of Ministers for the Union Territory of Arunachal Pradesh.

38. Constitution (Thirty-eighth Amendment) Act, 1975, amended Arts. 113, 213, 289 B, 352, 356, 359 and 360 of the Constitution. It made the declaration of Emergency by the President and the promulgation of Ordinances by the President, Governors, and Administrative Heads of Union Territories non-justiciable (beyond the purview of the judiciary).

It laid down that the satisfaction of the President, Governor or Authority as to the necessity of immediate action shall be final and shall not be questioned by any court on any ground. It also entitled the President to issue different proclamations on different grounds.

39. Constitution (Thirty-ninth Amendment) Act, 1975, amended Arts. 71 and 329 of the Constitution and the Ninth Schedule. It place the election of the President, Vice-President, Prime Minister and the Speaker beyond judicial scrutiny.

It provided for a new forum for the disposal of election questions relating to the incumbents of the four high offices—the President, Vice-President, Prime Minister and Speaker.

When a person has been appointed Prime Minister or chosen as a Speaker during the pendency of an election petition in respect of his (or her) election such petition shall abate. His (or her) election wil remain valid, notwithstanding any law made by Parliament before the commencement of the Constitution (Thirty-ninth Amendment) Act, 1975 in so far as it relates to elections. Such elections shall not be deemed to be void or ever to have become void onany ground whatsoever.

40. Constitution (Fortieth Amendment) Act, 1976, amended Art. 297 and declared that "all land, minerals and other things of value underlying the ocean within the territorial waters or the continental shelf or the exclusive economic zone of India shall vest in the Union and shall be held for the purpose of the Union."

"The limits of the territorial waters, the continental shelf, the exclusive maritime zone or other maritime zones of India shall be such as may be specified from time to time by or under any law made by Parliament"

41. Constitution (Forty-first Amendment) Act, 1976, raised the retiring age of State Public Service Commission members from 60 to 62. This does not affect the members of the Union Public Service Commission who retire at the age of 65.

42. Constitution (Forty-second Amendment) Act, 1976, was passed by Parliament on November 2, and after having been ratified by half of the State Assemblies received Presidential assent on December 18, 1976. The Amending Act is a piece of comprehensive legislation containing 59 clauses and touching upon varied constitutional questions.

The main features of the Amending Act may be summarised as follows:

1. The Preamble has been altered from 'sovereign democratic republic to sovereign socialist, secular democratic republic' and 'unity of the nation' into 'unity and integrity of the nation'.

2. The Directive Principles of the Constitution have been given precedence over Fundamental Rights, wherever they came into conflict.

3. Similarly prevention or prohibition of anti-national activities takes precedence over Fundamental Rights.

4. Certain Fundamental Duties are laid down which have to be observed by all citizens. Non-compliance with or refusal to observe the duties shall be punishable at law. No court shall question the validity of such actions.

5. Number of seats in the Lok Sabha and the State Assemblies which are based on population shall remain frozen as in the 1971 census till 2001 A.D., that is to say, for 2 more Decennial Censuses.

6. The duration of the Lok Sabha and the State Assemblies is increased from 5 to 6 years.

7. The quorum for the Lok Sabha and the State Assemblies prescribed in the Constitution has been removed which means that a quorum is no longer a constitutional necessity.

8. The Parliament may decide what offices are offices of profit under the government or what amounts to corrupt practice in disqualifying an elected member from any house of legislature.

9. Rights and privileges of members and committees of legislatures are to be decided by the concerned houses from time to time.

10. Proclamation of Emergency may be made applicable to any part of the counry (instead of the whole country). Similarly emergency can be lifted from any part of the country while it remains in force in other parts.

11. The duration of a Presidential proclamation taking over the government of a state shall be one year instead of six months.

12. The Union has the power to deploy armed forces to any state and to delimit cantonment areas in states. The state cannot exercise any power in the disposition of the armed forces or the administration of cantonment areas.

13. No court can question the competence of the Parliament to amend the constitution in any manner.

14. The Supreme Court alone can adjudicate on the validity of any central law and the High Courts can adjudicate on the validity of the state laws. If the validity of any state law is dependent on the validity of any central law or vice versa, then the Supreme Court can adjudicate on them. In any case, any decision on constitutional invalidity has to be made by a two-thirds majority of sitting judges where the number is not less than 5. If the number of judges is less than five the judgement has to be unanimous. It is also provided that the High Courts have no power to make an interim order, where it will impede or obstruct any enquiry or action by the government.

15. The President's liability to act in accordance with the advice of the Council of Ministers has been made practically mandatory.

Constn. (Forty-third Amendment) Act 1977 which received Presidential assent on April 3, 1978 (i) omits some Articles added by the Forty-second Amendment and (ii) alters other Articles.

The omissions relate to articles that give unfettered authority to the Executive or eliminate or restrict the powers of the Supreme Court and the High Courts. The alterations apply to Arts. 145, 226, 228 and 366.

All these omissions and alterations imply that the Constitution has reverted to the position that prevailed before the passing of the Forty-second Amendment, at least in matters specifically referred to in the Amendment.

Constn (Forty-fourth Amendment) act 1978 which received Presidential assent on April 30, 1979 brought in a number of changes. These apply to the following Arts. 19, 22, 30, 31, 31A, 31C, 38, 71, 74, 77, 83, 103, 105, 123, 132, 133, 134A, 139A, 150, 165, 172, 192, 194, 213, 217, 226, 227, 239B, 257A, Chapter IV. Part XX, 329, 329A, 352, 356, 358, 359, 360, 361, 371F, Ninth Schedule and Forty-second Amendment Sections 18, 19, 21, 22, 31, 32, 34, 35, 56 and 59.

Of these Arts. 19, 31, 31A, 31C, 38, 77, 83, 105, 123, 132, 133, 134A, 139A, 150, 165, 194, 213, 217, 225, 226, 227, 239B, 257A, 329, 329A, 371F, and sections 18 to 59 of Forty-second Amendment itself are either omissions or deal with details or are comparatively unimportant. Others deserve notice.

Art. 22. This article deals with preventive detention. The important change is that preventive detention for a period of more than 2 months can be ordered only on the recommendation of an Advisory Board, whose Chairman shall be a judge of a High Court.

Art. 30. The Amendment of this article reads as follows:

In article 30 of the Constitution, after clause (1), the following clause shall be inserted, namely:—

"(1A). In making any law providing for the compulsory acquisition of any property of an educational institution established and administered by a minority, referred to in clause (1), the State shall ensure that the amount fixed by or determined under such law for the acquisition of such property is such as would not restrict or abrogate the right guaranteed under that clause."

Art. 71. This Art. deals with questions relating to the election of President or Vice-President. The amended article reads:

"71 (1). All doubts and disputes arising out of or in connection with the election of a President or Vice-President shall be inquired into and decided by the Supreme Court whose decision shall be final.

(2) If the election of a person as President or Vice-President is declared void by the Supreme Court, acts done by him in the exercise and performance of the powers and duties of the office of President or Vice-President, as the case may be, on or before the date of the decision of the Supreme Court shall not be invalidated by reason of that declaration

(3) Subject to the provisions of this Constitution, Parliament may by law regulate any matter relating to or connected with the election of a President or Vice-President.

(4) The election of a person as President or Vice-President shall not be called in question on the ground of the existence of any vacancy for whatever reason among the members of the electoral college electing him."

Art. 74 deals with the powers of the President vis-a-vis the Cabinet. The amended article is as follows:

In article 74 of the Constitution, in clause (1), the following proviso shall be inserted at the end, namely:—

"Provided that the President may require the Council of Ministers to reconsider such advice, either generally or otherwise, and the President shall act in accordance with the advice tendered after such reconsideration."

Art. 83 restores the old term of 5 years to the Lok Sabha.

Art. 103 relates to questions concerning the disqualification of a member of Parliament. This is now to be decided by the President after consultation with the Election Commission.

Art. 172 restores the 5-year term of State Legislatures.

Box 36

46th Amendment

The Janata government presented the 49th Amendment Bill, 1979 on March 15, 1979 in the Lok Sabha for making far reaching changes in the sales-tax law of the country. Because the said government failed, the present government has introduced the Constitution (Forty-Sixth Amendment) Bill, 1981 on the April 3, 1981 in the Lok Sabha with the same clauses.

The bill seeks to amend articles 269, 286 and 366 of the Constitution of India and also insert a new item 92 B after entry 92 A in the Union list in the seventh schedule to the Constitution. It also proposes to add an explanation for the words "tax on the sale or purchase of goods."

Art. 192 relates to the disqualification of a member of a State Legislature. This is now to be decided by the Governor after consultation with the Election Commission.

Chapter IV Part XX is an addition. The amendment reads:

In Part XII of the Constitution, after Chapter III, the following Chapter shall be inserted, namely:—

Chapter IV—Right to Property

300 A. No person shall be deprived of his property save by authority of law".

Arts. 352, 356, 358, 359 and 360 deal with Emergency. An internal emergency can now be declared on "armed rebellion" breaking out and not for "internal disturbance". Other provisions relating to the emergency in Art. 356, 358, 359 and 360 have also been substantially altered.

Art. 361 restores protection to publications of proceedings of the Parliament and State Legislatures.

Ninth Schedule. entries 87, 92 and 130 have been deleted.

Constn. (Forty-fifth Amendment) Bill 1980 as passed by Parliament on the 25th of January 1980 reads:

Be it enacted by Parliament in the Thirtieth Year of the Republic of India as follows:—

(1) This Act may be called the Constitution (Forty-fifth Amendment) Act, 1980.

(2) It shall be deemed to have come into force on the 25th day of January, 1980.

(3) In article 334 of the Constitution, for the words "thirty years" the words "forty years" shall be substituted.

Constn. 46th Amendment Bill passed by the Parliament in Aug. 1982 seeks to remove certain lacunae in the existing sales tax legislation. The Bill is now before the State Assemblies for ratification.

105. PARTIES & ELECTIONS

I. THE PARTY SYSTEM

The Party System in India has developed on lines quite dissimilar to those which obtain in western democracies. The main trends noticeable in India are (1) absence of polarisation, or the lack of a powerful opposition, (2) a cleavage of parties on national and state bases and (3) endless proliferation.

Polarisation. The main reason why a polarisation of parties never took place in India was that the Indian National Congress had completely dominated the national scene. Besides, the Opposition itself had only a nominal existence in parliament. In fact till 1970, the Opposition leader was not even formally recognised. The first Opposition leader to be recognised as such, was Dr. Ram Subhag Singh, who was the leader of the Opposition Congress when the Congress split in 1970.

When the Janata Party came to power at the Centre in 1977 the Opposition Leader was given the status and rank of a Cabinet Minister. C. M. Stephen of Kerala was the first Opposition Leader to enjoy this status.‡

National and State Parties. Instead of polarising at the national level into ruling and opposition parties, another sort of polarisation took place at national and state levels. Political parties soon came to be classified as national and state parties. The national parties function on an all-India basis. They are integrative in character and ideologically committed to some form of political philosophy. The state parties have no special ideology. They are usually centered round local leaders and are mainly interested in local questions. Many of these parties are communal in character.

The fortunes of national parties depend very much upon the degree of power that state parties wield in their respective states. But since national parties are better organised and have much greater financial resources, the chances of any state party getting the better of a national party, ultimately, are however rather remote.

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‡ The Opposition Leader is a fictitious personage in most of the new democracies. In 1964, out of the 113 states who were members of the UN only 30 had a recognised Opposition in Parliament. Since 1964 one-party states have become fashionable and Opposition Leaders as a class appear to be on their way out from history.

Endless Proliferation. Many are hard put to explain why political parties tend to multiply in India at such prodigious rates. During the 30 years that have elapsed, the country has seen a proliferation of political parties such as no other country in the world has witnessed. A rough tally yields a hundred political parties of varied hues and shades that have come into existence since independence.

One explanation that has been offered is that the formation and functioning of political parties in India are not regulated by law. Any street corner speaker can call together a dozen fellow mates and form a party under any name. When the next election comes he can field his candidates without anyone questioning its legality or propriety. Whether he wins or loses is a quite different matter.

In contrast, we may notice the conditions under which a political party may be formed in the Federal Republic of Germany (W. Germany). In FRG every political party has to be registered under the law. Membership registers have to be maintained, accounts have to be kept and generally political parties have to function in an orderly manner. There is not even a semblance of registration in India, let alone orderliness. Any one can collect party funds and do what he likes with them without in any way tarnishing his own public image or the image of his party. Under such conditions it is no wonder that political parties in India have multiplied like bacilli.

Of the 100 and odd parties scattered throughout the length and breadth of India, hardly a score deserves notice. The rest is made up of people, who cluster round displaced local leaders or hang on to sheer parochialisms, in the hope that their turn will come some day. Many of them come to life during election time and go into hibernation till the next election. But to the dismay of the voter, they never disappear altogether. They exist only to swell the number of candidates, cloud the issues, and spread confusion all round.

Recognition of Political Parties. Under the Election Symbols (Reservation & Allotment) Order 1968, the Election Commission has the right to recognise political parties

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Highlights of State Elections 1983
Congress (I) Ousted from Andhra Pradesh and Karnataka

The new regional party, Telugu Desam, started nine months ago by the film star N. T. Rama Rao was swept to power in a landslide in Andhra Pradesh this evening, ending the uninterrupted Congress rule in the State.

Most of the Congress leaders and Ministers suffered defeat in the Andhra region. Agisam Veerappa, Minor Irrigation Minister, was defeated by the former Inspector-General of Police, K. Ramachandra Reddi, contesting on the Telugu Desam ticket in Nallamada. For the Congress (I) M. Baga Reddi and A. Madan Mohan, Ministers, (Medak district) were among the notable winners.

The ruling Congress (I) suffered its biggest jolt in Karnataka in the elections to the 224-member State Assembly with the defeat of the Chief Minister R. Gundu Rao, at the hands of a Janata nominee, B. A. Jivijaya, in Somwarpet constituency in his home district of Kodagu.

The BJP, which is outside the Opposition alliance and fought on its own, has secured 18 seats. It had declared its anti-Congress (I) stance nevertheless.

Independents, including the Belgaum-based Maharashtra Ekikaran Samithi, have secured 20 seats.

The Opposition alliance, in particular, made a clean sweep in the State capital, Bangalore.

The three-party CPI-M ruling Front in Tripura has won 39 seats, 37 by the CPI-M and two by the Revolutionary Socialist Party. The Tripura Congress (I) President, Ashoke Bhattacharya defeated the Relief Minister, Brija Gopal Roy (Forward Bloc) from Bordoalli.

Mrs. Maneka Gandhi's Sanjay Vichar Manch, making its electoral debut in alliance with the Telugu Desam, had fielded candidates in five constituencies and scored its first victory in Karimnagar by a margin of over 10,000 votes in a multi-cornered contest. The Manch is contesting on the Telugu Desam symbol.

January 7, 1983.

for allotment of symbols. Every candidate is allotted a symbol. If a candidate belongs to a political party the symbol is allotted to the party and the candidate uses it on behalf of the party.

The symbol is important, a large number of voters being illiterate. They cannot identify the candidates (or the party) whom they support or would like to support by reading their names on the ballot paper or for that matter on placards or bill boards. The only thing that helps them to identify the candidates is the symbol. In fact they vote for the symbol rather than the candidate.

It is the duty of the Election Commission to allot symbols for the various parties and/or the candidates whenever an election is announced. It is for this purpose that the Election Commission distinguishes between *recognised* and *unrecognised* parties. If a party is recognised, a particular symbol is 'reserved' for it. No other party or person can claim it or use it in the election campaign. Unrecognised parties, which include independent (unattached to any party) candidates, can always choose any symbol other than the reserved symbols. The main advantage of a reserved symbol is that it can be used for every election since no one other than the particular party has any claim for it. Unreserved or free symbols are allotted according to priority. The candidate who comes first gets the first choice. Those who come later will have to make do with whatever symbols are left over.

The list of recognised parties is revised after every general election in the light of the votes polled by them. The general criterion for recognition is that a party should secure at least four per cent of the total votes cast in a State.

If any such political party is treated as a recognised political party in four or more States, it enjoys the status of a National Party throughout the whole of India. If recognised in less than four States, a party enjoys the status of a 'State Party' in the State or States in which it is a recognised political party.

Developments in Party Politics. When India became free there were only two political parties worth the name—the mammoth Indian National Congress and the diminutive Communist Party of India. With independence many new parties came on the scene. When the first elections were held (1951 Dec.—1952 Jan.) as many as 77 parties joined the fray.

The first important dovelopment was the breakup of the Communist Party in 1964 into two factions, right and left. The rightists retained the name and goodwill of the old Communist Party of India. The leftists formed a new party—the Communist Party (Marxist).

A more momentous development occurred in 1969. The monolithic Congress Party split into two—the party led by the Prime Minister, Mrs. Indira Gandhi and the party led by the Congress President, Nijalingappa. In the 1971 elections the Congress Party under Mrs. Gandhi won a massive majority in the Lok Sabha (350) while the party led by Nijalingappa made a poor show winning only a miserable 16 seats.

The most important development in party politics in 1974 was the formation of the Bharatiya Lok Dal (BLD) or the *People's Party of India* in August 1974 at Delhi. The new party was formed by the merger of seven existing parties, namely, *Bharatiya Kranti Dal* (BKD), *Swatantra*, *Samyukta Socialist Party*, *Utkal Congress*, *Kisan Mazdoor Party*, *Rashtriya Lok Tantric Dal* and *Punjab Khetibar Zamindar Sabha*.

In 1977 when Mrs. Gandhi announced fresh elections to the Lok Sabha the miniscule opposition parties got together to offer a united challenge to the dominating Congress Party. Under Jaya Prakash Narain's inspiring lead the Jana Sangh, the Opposition Congress, the BLD and the newly formed CFD (Congress for Democracy) under Jagjivan Ram came together as the Janata party in May 1977 to offer a united front against the Congress led by Indira Gandhi.

The Janata party won the elections gaining an absolute majority in the Lok Sabha, leaving only 135 seats for the Congress.

Janata Party. The Janata party turned out to be a nine days' wonder. Morarji Desai, the veteran Congress leader, was elected leader of the party. He took over the government as Prime Minister on March 24, 1977. The new ministry put up a big show going into action on many fronts. But the writing on the wall was clear to all who cared to look beneath the surface. The Janata party had been weighed in the balance and found wanting. The fault lay in the leaders themselves. Petty infighting kept on returning like the proverbial bad penny. These finally led to the resignation of the Home Minister Charan Singh from the party's national executive and the parliamentary board. The Prime Minister reacted by asking Charan Singh and Raj Narain, the Health Minister, to resign from the cabinet.

The peace-makers intervened. In January 1979, Charan Singh returned to the cabinet as Deputy Prime Minister and Minister for Finance. But Jagjivan Ram, another leader, was also elevated as Deputy Prime Minister at the same time. The patch-work did not last long. Charan Singh and his followers refused to support Desai as Prime Minister. So he was obliged to resign Prime Ministership in July 1979. But he did not resign from the leadership of the party. In the circumstances Charan Singh formed a new party called Janata (Secular) or Janata (S) for short. Morarji at last resigned the leadership of the party and Jagjivan Ram succeeded him. Charan Singh and his supporters formed a new ministry while Jagjivan Ram continued as the leader of the Opposition. Charan Singh, however, had to fall back on Mrs. Gandhi's party to maintain the requisite majority. Mrs. Gandhi withdrew her support on August 20, 1979 and the Charan Singh ministry fell.

However, as Prime Minister he advised the President to dissolve the Parliament and order fresh elections. The President asked Charan Singh to continue in the meantime as Prime Minister of a caretaker government. In view of the coming elections, Charan Singh and Raj Narain formed a new party—Lok Dal. But the two leaders soon fell out. In the elections that followed Mrs. Gandhi came back to power as the leader of the Indian National Congress, more familiarly spoken of as Indira Congress or Congress (I).

In July 1981 the Election Commission recognised Congress (I) as the legitimate successor of the old Indian National Congress and de-recognised the Congress faction led by Devraj Urs (Congress (U)) as a national party. In August Jagjivan Ram replaced Devraj Urs as President and Congress (U) became Congress (J). Subsequently the Maharashtra leader Sharad Pawar became the President of the breakaway Congress and Congress (J) transformed itself as Congress (S).

The Janata party has since split up, the old Janata still (1982) continuing with Chandrasekhar as President. The Lok Dal, the original splinter party started by Charan Singh is now known as Janata (K) after its President Karpoori Thakur. However, the major element in the old Janata Party–the Jana Sangh–has gathered together under a new banner, the Bharatiya Janata Party, with A. B. Vajpayee as President. Meanwhile, a brand new party has appeared on the horizon, the Democratic Socialist party, with H. N. Bahuguna as President.

II. GENERAL ELECTIONS

LOK SABHA

The General Elections to the national Parliament and State Assemblies were held simultaneously till 1970. In 1971 this policy was given up. The national and State elections were 'de-linked' and held separately. Although no explanation has been offered for this departure in policy, it was probably the clash of interests between national and state parties that prompted this change.

First General Election 1952. The first general election was held in 1952. Fiftyone parties contested the Lok Sabha elections, out of which 21 entered the Lok Sabha.

Second General Election 1957. At the second general election, the Congress secured 371 out of 494 elective seats in the Lok Sabha.

Third General Election 1962. Out of 494 parliamentary seats the Congress won 361.

Fourth General Election 1967. At the fourth general election, the performance of the Congress party was comparatively poor. It secured only 283 seats out of 520.

Fifth General Election 1971. This was a mid-term election, the Lok Sabha having been dissolved on Dec. 27, 1971, one year and two months before the expiry of the full period. The results of the elections were startling. The Ruling Congress, under Indira Gandhi, swept the polls and came out with a massive majority of 350 out of 518 elective seats in the Lok Sabha.

Party Position in the Fifth Lok Sabha (As on January 18, 1977)

Indian National Congress	..	355
Communist Party of India	..	24
Communist Party (Marxist)	..	26
Congress (Opposition)	..	11
Bharatiya Jan Sangh	..	16
Praja Socialist	..	3

DMK	..	12
BLD	..	9
United Independent	..	8
Anna DMK	...	6
Kerala Congress	..	3
Muslim League	..	3
Forward Block	..	3
Unattached	..	28
Vacancies	..	17
Total	..	524

Duration of the Fifth Lok Sabha. On the 26th of June 1975 the President declared an Emergency. This Emergency was lifted only after the results of the Sixth General Election were announced, namely on the 22nd March, 1977.

During the emergency, the term of the Lok Sabha was extended to 6 years by the 42nd amendment. This extension was annulled by the 43rd amendment in 1977 and the old term of 5 years was restored.

Sixth General Election 1977. The 6th General Elections (March 1977) brought the Janata government to power. Janata won more than 296 seats in a total of 542 —a clear majority—while the Congress could muster only 153 seats.

Sixth Lok Sabha

(Party position as on March 24, 1977)

Janata	..	296
Congress (I)	..	153
CPI	..	7
CPM	..	22
ADMK	..	19
Akali	..	8
Other parties	..	19
Independents	..	15
Total	..	539
Vacant seats	..	3
Grand Total	..	542

Seventh General Elections 1980. The 7th General Elections (Jan. 1980) returned Indira Gandhi to power again with a two-thirds majority in the Lok Sabha.

Table 81

Allocation of Seats in Two Houses of Parliament and Party Position in Lok Sabha

(As on 1st March 1980)

		Lok Sabha								
States	*No. of seats in Rajya Sabha*	*Seats*	*Congress (I)*	*Janata (S)*	*CPI (M)*	*Janata*	*DMK*	*Other Parties*	*Un-attached*	*Total*
Andhra Pradesh	18	42	41	—	—	—	—	1[2]	—	42
Assam	7	14	2	—	—	—	—	—	—	2 (12 vacant)
Bihar	22	54	29	5	—	8	—	8[3]	3	53 (1 vacant)
Gujarat	11	26	25	—	—	1	—	—	—	26
Haryana	5	10	5	4	—	1	—	—	—	10
Himachal Pradesh	3	4	3	—	—	—	—	—	—	3 (1 vacant)
Jammu and Kashmir	4	6	1	—	—	—	—	4[4]	—	5 (1 vacant)
Karnataka	12	28	27	—	—	1	—	—	—	28
Kerala	9	20	5	—	6	—	—	7[5]	2	20
Madhya Pradesh	16	40	35	—	—	4	—	—	1	40
Maharashtra	19	48	39	—	—	8	—	1[6]	—	48
Manipur	1	2	1	—	—	—	—	1[7]	—	2
Meghalaya	1	2	1	—	—	—	—	—	—	1 (1 vacant)
Nagaland	1	1	1	—	—	—	—	—	—	1
Orissa	10	21	20	1	—	—	—	—	—	21
Punjab	7	13	11	—	—	—	—	—	1	12[1]
Rajasthan	10	25	18	2	—	4	—	1[8]	—	25
Sikkim	1	1	—	—	—	—	—	—	1	1
Tamil Nadu	18	39	20	—	—	—	16	3[9]	—	39

Tripura	1	2	—	—	2	—	—	—	—	2
Uttar Pradesh	34	85	51	30	—	3	—	1[10]	—	85
West Bengal	16	42	4	—	28	—	—	10[11]	—	42
Union Territories										
Andaman and Nicobar Islands	1	1	1	—	—	—	—	—	—	1
Arunachal Pradesh	1	2	2	—	—	—	—	—	—	2
Chandigarh		1	1	—	—	—	—	—	—	1
Dadra and Nagar Haveli		1	1	—	—	—	—	—	—	1
Delhi	3	7	6	—	—	1	—	—	—	7
Goa, Daman and Diu	—	2	1	—	—	—	—	—	1	2
Lakshadweep	—	1	—	—	—	—	—	1[12]	—	1
Mizoram	1	1	—	—	—	—	—	—	1	1
Pondicherry	1	1	1	—	—	—	—	—	—	1
Anglo-Indian (Nominated)		2	—	—	—	—	—	—	2	2
Nominated by President under Section 80 (i)(a) of the Constitution	12	—	—	—	—	—	—	—	—	—
Total	244	544	352	42	36	31	16	38	12	527 (16 vacant)

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[1] Excluding the Speaker

[2] Congress (U)—1

[3] Congress (U)—4; CPI—4

[4] Congress (U)—1; National Conference—3

[5] Congress (U)—3; CPI—2; Muslim League—2

[6] Congress (U)—1

[7] CPI—1

[8] Congress (U)—1

[9] AIADMK—2; Muslim League—1

[10] CPI—1

[11] Revolutionary Socialist Party—4; Forward Bloc—3; CPI—3

[12] Congress (U)—1

III. STATE ELECTIONS

The normal term of a State Legislative Assembly is five years, from the date of appointment for its first meeting.* Election to every Legislative Assembly is direct and on the basis of adult suffrage.

General Elections & Mid-term Elections. The general elections to the State Assemblies, since independence, present a confused picture, primarily because new States and Territories have been created, and many territorial adjustments among the old and the new have been made.

As early as 1953, Andhra Pradesh was carved out in the south. This was followed by the large-scale reorganisation of States in November 1956. Next, the state of Bombay was bifurcated in May 1960 into Maharashtra and Gujarat. The latest reorganisation has come about as a result of the North Eastern Areas (Reorganisation) Act 1971. The North Eastern region of the country now has five States, namely Assam, Nagaland, Meghalaya, Manipur and Tripura and two Union Territories, namely, Mizoram and Arunachal Pradesh.

Territorial reorganisation has led to consequential changes on the election scene. The composition of State Legislative Assemblies has altered, delimitation of assembly constituencies has been done afresh or re-adjusted wherever necessary and orders relating to Scheduled Castes and Scheduled Tribes have been modified.

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Nagaland Elections Nov. 1982

In the elections to the State Assembly the ruling Naga National Democratic party won 24 seats out of a total of 60, while the Congress (I) bagged 23 seats. Twelve constituencies returned Independents. In one constituency counting is held up owing to allegations of irregularities in polling.

While 8 of the Independents are reported to have joined hands with Congress (I) giving it a majority of 31, four Independents have come together to form a new party—Nagaland People's Party.

—News Report Nov. 15, 1982.

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* The terms of State Assemblies were extended to 6 years by the 42nd Amendment. The 43rd Amendment restored the old period of 5 years.

Besides, mid-term elections in various States have added their own confusion. These elections come at odd times upsetting the statutory pattern of general elections. Between the first general election in 1951-52 and the fifth general election in 1972, there have been as many as 20 mid-term elections in different States.

Table 82
State General Elections

1st	General Election	Dec. 1951-Jan. 1952
2nd	,,	Mar. 1957
3rd	,,	Feb. 1962
4th	,,	Feb. 1967
5th	,,	Mar.—Apr. 1972

Table 83
Mid-term Elections

Pepsu (Punjab-Haryana)	..	Feb.	1954
Travancore-Cochin (Kerala)	..	Feb.	1954
Andhra Pradesh	..	Feb.	1955
Kerala	..	Feb.	1960
Orissa	..	June	1961
Goa, Daman & Diu	..	Dec.	1963
Nagaland	..	Jan.	1964
Pondicherry	..	Aug.	1964
Kerala	..	Mar.	1965
Haryana	..	May	1968
Bihar	..	Feb.	1969
Punjab	..	,,	,,
Uttar Pradesh	..	,,	,,
Nagaland*	..	,,	,,
West Bengal	..	,,	,,
Pondicherry	..	Mar.	1969
Kerala	..	Sept.	1970
Orissa	..	Mar.	1971
Tamil Nadu	..	,,	,,
West Bengal	..	,,	,,

1972 Elections. Sixteen States and two Union Territories held elections in March and one Union Territory (Mizoram) in April, 1972.

Five States and five Territories did not go to polls: (1) Kerala (2) Nagaland (3) Orissa (4) T. Nadu (5) UP (States); (1) A & N Islands (2) Lakshadweep (3) Chandigarh (4) D & N Haveli and (5) Arunachal Pradesh (Territories).

State Election Results: Winning parties 1972

States

1. Andhra Pradesh—Ruling Congress (216 seats out of 287 seats)
2. Assam—R. Congress (94 out of 114)
3. Bihar—R. C. (167/318)
4. Gujarat—R. C. (139/198)
5. Haryana—R. C. (52/81)
6. Himachal Pradesh—R. C. (51/65)
7. Jammu & Kashmir—R. C. (51/65)
8. Karnataka—R. C. (165/216)
9. Madhya Pradesh—R. C. (220/296)
10. Maharashtra—R. C. (223/270)
11. Manipur—(Manipur People's Party 18, R. C. 17, seats out of 60)
12. Meghalaya— All party Hill Leaders' Conference (32/60)
13. Punjab—R. C. (66/104)
14. Rajasthan—R. C. (145/184)
15. West Bengal—R. C. (216/280)

Territories

1. Delhi—R. C. (44/56)
2. Goa, Daman & Diu-Maharashtrawadi Gomantak Party (18/30)
3. Mizoram—Mizo Union (21/30)

State Elections 1977
Winning Parties: States

March Election

Kerala-Ruling Front 111/140. The Ruling Front consisted of 7 parties. Leading parties: National Congress (0)—38, Kerala Congress—20, CPI—23, Muslim League—13, and RSP (Kerala) 9.

June Elections

Bihar—Janata 214/324
Haryana—Janata 75/90
Himachal Pradesh—Janata 53/68
Madhya Pradesh—Janata 230/320
Orissa—Janata 110/147
Punjab—Akali Dal 59/117
Rajasthan—Janata 150/200
Tamil Nadu—AIADMK 130/234
Uttar Pradesh—Janata 351/425
W. Bengal—CPM 178/254

Territories

Delhi—Janata 46/56
Goa, Daman & Diu—MGP 15, Congress 10/30
Pondicherry-AIADMK 14, Janata 7/30

State Elections Feb. 1978
Winning Parties

States

Andhra Pradesh—Cong. (I) 175/294
Assam—Janata 53, Cong. (R) 26/126
Karnataka—Cong. (I) 150/224
Maharashtra—Janata 100, Cong. (R) 69/288
Meghalaya—Cong. (R) 20, APHLC 16, HSPDP 14/60

Territory

Arunachal Pradesh—Janata 17/30

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* Nagaland and Pondicherry have had two general elections, in the normal course, though they were necessarily mid-term. The Legislative Assembly of Nagaland was first constituted in Jan. 1964 and that of Pondicherry in Aug. 1964.

MGP—Maharashtrawadi Gomantak Party
AIADMK—All India Anna Dravida Munnetra Kazhakam.
APHLC—All Party Hill Leaders' Conference.
HSPDP—Hill States People's Democratic Party.

Table 84

Strength of Legislative Assemblies and Party Position

(As on 1 June 1980)

	State/ Union Territory	*Total Strength*	*Janata (JP)*	*BJP*	*Janata (S) (CS)*	*INC(I)*	*INC(U)*	*C. P. I.*	*C. P. M.*	*Other Parties*	*Independ-ents*	*Vacent*
1	Andhra Pradesh	294	7	3	9	251	3	6	8	3	3	1
2	Assam‡	126	28	—	4	36	16	6	11	13	8	4
3	Bihar	324	13	21	42	167	14	23	6	16	19	3
4	Gujarat	182	21	9	1	140	—	—	—	—	10	1
5	Haryana	90	15	—	23	48	—	—	—	—	1	3
6	Himachal Pradesh	68	1	24	1	34	—	—	1	—	4	3
7	Jammu & Kashmir*	76	11	—	2	7	1	—	—	52	1	2
8	Karnataka	224	18	—	—	161	30	3	—	2	7	3
9	Kerala	140	5	—	—	17	22	17	34	44	1	—
10	Madhya Pradesh	320	2	60	1	246	—	2	—	1	8	—
11	Maharashtra	288	17	14	—	186	47	2	2	8	12	—
12	Manipur	60	4	—	—	37	6	5	1	4	3	—
13	Meghalaya	60	1	—	—	—	—	—	—	55	2	2
14	Nagaland	60	—	—	—	24	—	—	—	35	—	1
15	Orissa	147	3	—	13	117	2	4	—	—	7	1
16	Punjab	117	—	1	—	63	—	9	5	37	2	—
17	Rajasthan	200	8	32	7	133	6	1	1	—	12	—
18	Sikkim	32	—	—	—	—	—	—	—	31	1	—
19	Tamil Nadu	234	2	—	—	30	—	10	11	180	1	—
20	Tripura	60	—	—	—	—	—	—	50	7	1	2
21	Uttar Pradesh	425	4	11	59	306	13	7	—	4	17	4
22	West Bengal	294	23	—	5	18	3	2	174	60	4	5
23	Arunachal Pradesh	30	—	—	—	20	—	—	—	8	2	—
24	Delhi	56	—	—	—	Metropolitan Council dissolved on 21-3-1980.						
25	Goa, Daman & Diu†	30	—	—	—	22	—	—	—	7	1	—
26	Mizoram	30	2	—	—	—	—	—	—	28	—	—
27	Pondicherry	30	3	—	—	10	—	—	1	16	—	—
	Total	3997	188	175	167	2073	163	97	305	611	127	35

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‡ Assam Legislative Assembly under suspension w. e. f. 12-12-1979.

* Excluding 24 seats ear-marked for Pakistan occupied territory.

† Latest party position not received.

Other Parties referred to in Col. (10) included:

1	Andhra Pradesh	Majillis Ittehad-ul-Muslimeen 3.
2	Assam	Plains Tribals Council of Assam 4, Revolutionary Communist Party of India 4, Assam Janata Vidhayani Dal 5.
3	Bihar	Forward Bloc 1, Jharkhand Mukti Morcha 13, Janata (S)—RJ 1, Marxist Co-ordination 1.
4	Jammu & Kashmir	National Conference 48, Jamait-E-Islami, Inqualabi National Conference 2, J & K People's Conference 1.
5	Karnataka	Muslim League 1, Republican Party of India 1.
6	Kerala	Muslim League 14, Kerala Congress (M) 8, Revolutionary Socialist Party 6, Kerala Congress (J) 6, All India Muslim League 5, National Democratic Party 3, Kerala Congress (P) 1, Praja Socialist Party 1.
7	Madhya Pradesh	Republic Party of India (Khobragade) 1.
8	Maharashtra	Peasants & Workers Party 8.
9	Manipur	Manipur People's Party 4.

10	Meghalaya	All Party Hill Leaders Conference 20, Public Demands Implementation Convention 2, United Meghalaya Parliamentary Democratic Forum 33.
11	Nagaland	Naga National Democratic Party 35.
12	Punjab	Shiromani Akali Dal 37.
13	Sikkim	Sikkim Janata Parishad 22, Sikkim Congress (R) 8, Sikkim Prajatantra Congress 1.
14	Tamil Nadu	All India Anna Dravida Munnetra Kazhagam 129, Dravida Munnetra Kazhagam 38, All India Forward Bloc 3, Tamil Nadu Kamaraj Congress 3, Gandhi Kamaraj National Congress 6, Indian Union Muslim League 1.
15	Tripura	Revolutionary Socialist Party 2, Forward Bloc 1, Tripura Upajati Juba Samiti 4.
16	Uttar Pradesh	Janata Party (S)—Raj Narain 4.
17	West Bengal	Forward Bloc 27, Revolutionary Socialist Party 20, Revolutionary Communist Party of India 3, Forward Bloc (Marxist) 3, Biplabai Bangla Congress 1, Socialist Unity Centre 4, Muslim League 1, Communist Party of India (Marxist-Leninist) 1.
18	Arunachal Pradesh	People's Party of Arunachal Pradesh 8.
19	Goa, Daman & Diu	Maharashtrawadi Gomantak Party 7.
20	Mizoram	People's Conference 19, People's Conference 'B' Group 4, Mizoram Congress Group 5.
21	Pondicherry	Dravida Munnetra Kazhagam 15, Indian Union Muslim League 1.

106. NATIONAL ECONOMY

The year 1981-82 may broadly be described as an year of recovery. According to *The Economic Survey* 1981-82, the economic situation has shown a distinct improvement.

Inflation. There was a marked deceleration in inflationary pressures during 1981-82. The annual rate of inflation, as measured by the Wholesale Price Index, came down to 5.4 per cent as on January 16, 1982 as against 16.2 per cent on January 17, 1981. The deceleration in wholesale prices is gradually getting reflected in the Consumer Price Index as the annual rate which peaked in August 1981 to 14.4 per cent has come down to 12.7 per cent in December 1981. However, despite significant deceleration, inflationary pressures persist and require continued vigilance. The balance of payments remained under pressure during 1981-82.

Capital & Savings. The rate of gross domestic capital formation increased from 22.9 per cent in 1979-80 to 24.2 per cent in 1980-81, slightly below the peak level of 24.6 per cent achieved in 1978-79. The gross domestic savings decreased marginally from 22.5 per cent in 1979-80 to 22.2 per cent in 1980-81. The gap between gross domestic savings and capital formation was financed by the inflow of foreign savings.

G. N. P. The growth of Gross National Product (GNP) of 7.5 per cent in 1980-81 turned out to be much higher than expected. During 1981-82 GNP in real terms is expected to grow further by nearly 4.5 per cent. Thus in the first 2 years of the Sixth Plan period, growth in real GNP will significantly exceed the target growth rate of 5.2 per cent per annum during the plan period.

Agriculture. Agricultural production is expected to increase by over 3 per cent during 1981-82 on top of the 15.4 per cent increase in 1980-81 and against a decline of 15.5 per cent in 1979-80. Despite the early withdrawal of the south west monsoon, kharif production in foodgrains which remained at around 80 million tonnes in 1981-82 will be higher by 2.6 million tonnes than the previous year. The prospects of cash crops for 1981-82 are equally good. Sugarcane production is expected to increase significantly while major oil seeds show promise of a heavy increase. Similarly, fibre crops like jute, mesta and cotton are likely to reach higher figures than the previous year.

Table 85

Selected Economic Indicators

Percentage change over previous year

	1974-75	*1975-76*	*1976-77*	*1977-78*	*1978-79*	*1979-80*	*1980-81*	*1981-82*
Gross National Product at 1970-71 prices	1.2	9.6	1.3	8.6	5.3	—4.8	7.5(a)	4.5(b)
Agricultural production	—3.2	15.2	—7.0	14.5	3.4	—15.5	15.4	3.0(b)
Foodgrains production	—4.6	21.2	—8.1	13.7	4.3	—17.1	18.4	3.0(b)
Industrial production	3.2	7.2	9.6	3.3	7.6	—1.4	4.0	9.8(c)
Electricity generated(i)	5.2	12.9	11.5	3.4	12.2	2.1	5.9	11.6(d)
Wholesale prices (on point to point basis)	10.1	—6.5	12.0	0.3	4.6	21.4	16.7	3.0(e)
Monetary resources(M_3)	10.9	15.0	23.6	18.4	21.9	17.7	17.6	11.3(f)
Imports (in current prices)	52.9	16.5	—3.6	18.7	13.2	32.4	38.2	4.0(g)
Exports (in current prices)	31.9	21.4	27.2	5.2	5.9	12.8	3.9	14.1(g)
Foreign exchange assets (excluding gold and SDRs)	5.1	144.3	91.9	57.2	16.0	—1.1	—6.6	—27.2(h)

(a) Quick estimates.
(b) Anticipated.
(c) April-November 1981 over the same period in 1980.
(d) April-December 1981 over the same period in 1980.
(e) March 28, 1981—January 16, 1982.
(f) As on January 8, 1982 compared with March 31, 1981.
(g) Provisional figures for April-October, 1981 over the same period in 1980.
(h) As on January 31, 1982 compared with January 31, 1981.
(i) Electricity generation refers to utilities only.

Industrial Production. The improvement in industrial production which picked up in the middle of 1980-81 was sustained throughout 1981-82. Industrial production increased by 9.8 per cent during April—November 1981 over the level achieved during the same period of 1980. On present indications, the growth in industrial production is expected to increase by about 8 per cent during 1981-82 as against 4 per cent in 1980-81 and a decline of 14 per cent in 1979-80.

Price Trends. Inflationary pressures eased considerably during 1981-82. The annual rate of inflation on a point to point basis, as measured by the Wholesale Price Index, came down to 5.4 per cent as on January 16, 1982 from 16.2 per cent as on January 17, 1981 and 22.8 per cent as on January 19, 1980. The deceleration in the Wholesale Price Index has been widespread and this is being gradually reflected in the Consumer Price Index. The annual rate of inflation as measured by the Consumer Price Index peaked in August 1981 to 14.4 per cent and has since decelerated. It was 13.4 per cent in September, 13.3 per cent in October and 12.7 per cent in December 1981.

Balance of Trade and Payments. The external trade and balance of payments situation has been under severe strain since 1979-80. The deterioration in the balance of payments was caused by the sharp increase in the import bill due to substantial increases in the prices of oil and other major imports. The trade deficit increased to Rs. 5756 crores in 1980-81 as against Rs. 2563 crores in 1979-80. The balance of payments will continue to remain under pressure during 1981-82 even though the trade deficit for the year as a whole is likely to be somewhat lower than the 1980-81 level because of lower crude and petroleum imports. The pressure on balance of payments is reflected by the movement in foreign exchange reserves which have declined by Rs. 1292 crores during the current financial year, upto January 31, 1982 after taking credit for the receipt of Rs. 637 crores under the International Monetary Fund extended arrangement.

107. PLANNING

Planning Commission. A planned economy for development had been advocated in India, long before independence. But it was only after independence that a planned programme of development was taken up. In March, 1950, the Government of India set up a Planning Commission to prepare a plan for 'the most effective and balanced utilisation of the country's resources'. The Planning Commission has since been functioning as the kingpin of national development.

First Plan 1951-56. The first Plan was a rather haphazard venture, as the Planning Commission had no reliable statistics to work upon. Besides, the plan had to be co-related to the prevailing activities of various government departments. The result was patchwork of isolated projects. All the same, the plan had a national character and was based on a rational hypothesis. It laid emphasis on agriculture, irrigation, power and transport so as to provide an infrastructure for rapid industrial expansion in future. The plan turned out to be more than a success, mainly because it was supported by two good harvests in the last two years. "Harvests", as the World Bank report of 1970 said, "make all the difference in the Indian economy, which operates so near the subsistence margin".

Second Plan 1956-61. The Second Plan (1956-61) was a big leap forward. It laid special stress on heavy industries. The industrial policy resolution was amended so as to shift the primary responsibility for development on the public sector. Private sector was left to handle consumer industries. But the great quantity of imports that the plan envisaged in both public and private sectors, practically denuded India's accumulated sterling balances (as much as Rs. 500 crores) in two years and compelled the country to seek extensive foreign aid. Agriculture and small-scale industries remained sluggish, without adding any momentum to development. "Inflationary pressures too rose sharply in the early years of the Second Plan and although a massive tax effort was put through, the Plan ended up with far greater deficit financing than was envisaged". However, by the end of the Second Plan agricultural output had increased and the price situation had eased.

Third Plan 1961-66. The Third Plan rode on a wave of high expectations following overall growth of the Indian economy in the first two plan periods. The Third Plan aimed at establishing a self-sustaining economy, internal resources having been strained to the utmost, the Plan had to rely on heavy foreign aid.

During the Third Plan, national income (revised series) at 1960-61 prices rose by 20 per cent in the first four years but registered a decline of 5.6 per cent in the last year. Per capita real income in 1965-66 was about the same as it was in 1960-61.

Agriculture played a devastating role with production remaining indifferent in the first three years and precipitately falling in the last two, mainly on account of drought. This led to large scale imports of foodgrains and other agricultural commodities, a greater dependence on foreign aid and to a larger deficit financing.

On the balance of payments side, strains had begun to develop at the very beginning of the Third Plan. In the face of rising food and other imports and insufficient increase in exports the situation worsened; the country sought larger and larger foreign assistance.

A growing trade deficit and mounting debt obligations led to more and more borrowings from the International Monetary Fund. The rupee was devalued in June, 1966 to little purpose, as it soon turned out. The Third Plan had become stuck.

Interim Planning. The Third Plan having gone awry, planning itself had become discredited in the eyes of many and demands were made from different quarters to declare a Plan holiday. But neither the Government nor the Planning Commission admitted failure. They refused to fall in with the demand for a Plan holiday and proceeded to draw up the Fourth Plan as from 1966-67. But the economy had so far degenerated that the Fourth Plan could not be started in time, that is to say in 1966. Instead, as a stop-gap arrangement planning was made annual. The Annual Plans continued from 1966 to 1969—1966-67, 1967-68 and 1968-69.

Depressed farm output for two consecutive years 1965-66 and 1966-67, decline in the rate of growth of industrial production and pressure on the price line eroded resources available for the Annual Plans. Receipts from taxes were below the anticipated levels and non-Plan expenditures were higher.

The shortfall in the Annual Plans was made up by deficit financing, which added upto Rs. 682 crores during the three annual plans.

Fourth Plan 1969—74. The Fourth Plan (1969-74) officially commenced on April 1, 1969 with the publication of the Draft Plan. *Growth with stability* was the main objective of the Plan. Agriculture was expected to lead the growth with a rate of 5 per cent per annum. Such a growth in agriculture would set up a chain reaction in several spheres of economy. The target for the growth rate of industry was set at about nine per cent per annum. Altogether the national income was expected to increase at the rate of 5.5 per cent per annum. Allowing for the increase of population at the rate of about 2.5 per cent, the per capita income was expected to increase at the rate of 3 per cent per annum or about 16 per cent in the Fourth Plan period.

Fifth Plan 1974—79. The V Plan draft as originally drawn up was part of a long term *Perspective Plan* covering a period of 10 years from 1974-75 to 1985-86. The perspective plan attempted to co-ordinate various sectors of the economy in terms of the new slogan 'Garibi Hatao' (Remove Poverty). The long term rate of growth which the economy was expected to achieve on a self-sustaining basis was put up at 6.2 per cent per annum.

By the time the V plan was approved by the National Development Council (Sept. 1976) its premises had become obsolete and the total outlay had to be increased from Rs. 37,463 crores to 39,303 crores.

This belated attempt had an inglorious end in another 6 months, when the Janata party came into power. They scrapped it unceremoniously.

The Janata government re-constituted the planning commission and announced a new strategy in planning. The strategy involved a change in objective and pattern. The objective was laid down as *Growth for Social Justice* instead of *Growth with Social Justice*—a distinction without a difference. The new pattern was the Rolling Plan which merely meant that every year the performance of the plan will be assessed and a new plan based on such assessment will be made for the next year- a continuous planning in fact. The rolling plan started with an Annual plan for 1978-79 and as a continuation of the terminated V plan.

Annual Plan 1978-79. The main objects of the 1978-79 plan were (a) the removal of unemployment and substantial under-employment within approximately 10 years, (b) provisions of basic services (drinking water, primary education and health care) to the 40 per cent of the population in the lowest income groups over the same period, and (c) a significant reduction in the present disparities of income and wealth.

The total outlay for the Annual Plan (including expenditure by the Centre, States and Union Territories) for 1978-79 was placed at Rs. 11,650 crores as against Rs. 9960 crores in 1977-78. This represented an increase of 17 per cent over the previous year.

Annual Plan 1979-80. The plan outlay for 1979-80 based on the budget of 1979-80 was initially worked out as Rs. 11,591 crores. But when the final plan was released in Sept. 1979 the total outlay had to be increased to Rs. 12,601 crores because prices had increased by 19 per cent in the interval.

The 1979-80 plan was rural-oriented. The estimated outlay for rural development came to over Rs. 5000 crores or about 40 per cent of the total plan outlay.

Sixth Plan 1980-85. The VI plan for 1978-83 originally drawn up was revised and released by the Janata government on Dec. 2, 1979. Soon after the release of the revised plan Janata went out of power and a Congress government under Indira Gandhi took over. The Congress government 'rolled up' the Rolling Plan and superseded the 1978-83 plan by a new plan for 1980-85.

The Sixth Plan has been formulated against the background of a perspective covering a period of 15 years from 1980-81 to 1994-95. It takes into account the achievements and shortcomings of the past three decades of planning and recent economic development and difficulties, like acute inflationary pressures, setbacks in critical spheres of economy like power, coal, steel and transport and the steep rise in the price of petroleum products resulting in an increasing deterioration in the terms of trade and balance of payments. "The removal of poverty" says the Plan Document "is the foremost objective of the Sixth Plan".

Other objectives of the sixth plan include, step-up in the growth rate of the economy modernisation, with a view to economic and technological self reliance, speedy development of indigenous sources of energy, reduction of inequalities in income and wealth, removal of regional inequalities, regulation of population, harmonisation of short term and long term goals of development and conservation of ecological environmental assets. The last objective is fairly new. The induction of ecology into planning has its own complications. For, all our existing plans of development violate ecology in varying degrees and in various ways. Therefore ecology is likely to throw a spanner into all our development schemes. A typical example is the Silent Valley hydro-electric project in Kerala. It has been shelved in response to the protests of our ecologists. The net result is that Kerala, so long a power surplus state, will soon turn into a power deficit state.

Plan Investment. The Sixth Plan envisages a total investment (gross capital formation) of Rs. 158,710 crores over the plan period 1980-85 at 1979-80 prices. This is to be financed by domestic saving of Rs. 149,647 crores estimated at 1979-80 prices during the Sixth Plan and the net inflow of funds from abroad to the extent of Rs. 9063 crores. Thus, nearly 94.3 per cent of the total investment is to be financed from domestic resources.

The total Plan investment for the period 1980—85 is estimated at Rs. 158,710 crores. Of this, Rs. 84,000 crores (53 per cent) is estimated to be in the public sector and the balance of Rs. 74,710 crores (47 per cent) in the private sector.

Growth Rate. The Sixth Plan aims at a growth in gross domestic product of 5.2 per cent a year and per capita income by 3.3 per cent annum. Thus by 1984—85 per capita income is expected to reach Rs. 1744 at 1979-80 prices as compared with Rs. 1422 in the base year. The broad sectoral growth rates can be seen from the Table below.

Table 86

Sectoral Growth Rates 1979-80 and 1984—85

(Percentages)

Sector	*1979-80*	*1984—85*
Agriculture	35.13	32.90
Mining and Manufacturing	19.59	21.22
(A) Mining	1.52	2.01
(B) Manufacturing	18.07	19.21
(i) Food products	1.77	1.70
(ii) Textiles	3.11	2.88
(iii) Wood and Paper Products	1.02	1.03
(iv) Leather and Rubber Products	0.50	0.52
(v) Chemical Products	2.55	3.09
(vi) Coal and Petroleum Products	0.45	0.49
(vii) Non—Metallic Mineral Products	1.05	1.05
(viii) Basic Metals	1.28	1.43
(ix) Metal Products	0.98	1.10
(x) Non—electrical Engineering Products	1.38	1.66
(xi) Electrical Engineering Products	0.60	0.71
(xii) Transport Equipment	1.02	1.23
(xiii) Miscellaneous Industries	2.40	2.26
Electricity	1.71	1.88
Construction	5.07	5.06
Transport	4.89	4.95
Services	33.61	34.00
Total	100.00	100.00

Table 87

VI Plan Resources

(Rs. crores at 1979—80 prices)

		Centre	*States*	*Total*
1	Balance from current revenues at 1979-80 rates of taxes	1178	13300	14478
2	Contribution of public enterprises	8911	—516	8395
3	Market borrowings (excluding market borrowings of financial institutions)	15000	4500	19500
4	Small savings	2112	4351	6463
5	Provident funds	1660	2042	3702
6	Term loans from financial institutions	—	2722	2722
7	Misc. capital receipts (net)	6170	—2161	4009
8	Inflow of foreign resources	9929	—	9929
	i) Net aid	5889	—	5889
	ii) Other inflows	4040	—	4040
9	Drawing of foreign exchange reserves	1000	—	1000

10	Additional resources mobilisation	12290	9012	21302
11	Uncovered gap/deficit financing	5000	—	5000
12	Total resources	64250	33250	97500
13	Central assistance for state plans	—15350	+15350	—
14	Resources available for plan (12—13)	48900	48600	97500

+ Inclusive of union territories.

Table 88
VI Plan Targets

	Commodity	*Unit*	*1970—80*	*1984—85*
1	Food grains	Mill. tonnes	109	149-154
2	Sugarcane	Mill. tonnes	128	200-215
3	Jute and mesta	Lakh bales (180 kg each)	80.3	91
4	Cotton	Lakh bales (170 kg each)	77	92
5	Oilseeds (5 major)	Lkh tonnes	81	110
6	Coal	Mill. tonnes	103.96	165
7	Lignite	Mill. tonnes	3.12	8
8	Iron ore—lumps and fines	Mill. tonnes	39	55
9	Iron ore—concentrated	Mill. tonnes	—	5
10	Cloth	Mill. metres	10435	13030
11	Paper and paper board	Thou. tonnes	1050	1500
12	LD polyethylene	Thou. tonnes	71.3	100
13	HD polyethylene	Thou. tonnes	25.4	27
14	Polyprophylene	Thou. tonnes	13.4	27
15	PVC	Thou. tonnes	49.0	128
16	Nitrogenous fertilizers (N)	Thou. tonnes	2226	4200
17	Phosphatic fertilizers (P 205)	Thou. tonnes	757	1400
18	Cement	Mill. tonnes	17.68	33-34
19	Saleable steel (plain carbon)	Mill. tonnes	7.38	11.51
20	Aluminium	Thou. tonnes	192	300
21	Copper-refined	Thou. tonnes	18.8	45
22	Zinc	Thou. tonnes	52.65	85
23	Lead	Thou. tonnes	11.4	25
24	Electricity generation	Bill. kwh.	112	191
25	Originating traffic in railways	Mill. tonnes	217.8	309

A Review of the Sixth Plan. A review of the VI Plan carried out by the Planning Commission in August 1982 says that a minimum additional outlay of about Rs. 10,000 crores at 1981-82 prices over and above the projected outlay of Rs. 97,500 crores will be necessary for achieving the physical targets fixed.

The review says that taking into account the rise in prices and cost escalation since 1979-80 and the poor performance of several States in mobilising resources in line with the Plan targets, it is clear that it will not be possible to finance a Plan outlay of Rs. 97,500 crores in real terms at 1979-80 prices. "Some scaling down of the Plan is inevitable". The review has made these following other points.

Industrial production increased by four per cent in 1980-81 and showed a further eight per cent in 1981-82. However, it is worth noting that industrial growth rate declined in each quarter of 1981-82. It decelerated from 11.3 per cent in the first quarter to 9.1 in the second, 7.5 in the third and 4.8 per cent in the fourth. If this trend persists, there is likely to be a fall in industrial growth in 1982-83.

Power shortage and strained industrial relations continue to be a constraint on a number of industries, especially those belonging to the transportation and the automobile sector. There should be a step-up in the public sector outlay in some sectors such as Railways and power, a selective relaxation of credit controls for industries like commercial vehicles and tractors and review of imports in cases where they hurt utilisation of domestic capacities.

In 1980-81, the economy recorded a growth rate of 7.5 per cent and the rate for 1981-82 is estimated at 6 per cent. The average growth rate for the two years works out to 6 per cent as against the targeted rate of 5.2 per cent for the Sixth Plan. This is an encouraging feature.

The medium-term prospects for agriculture are somewhat uncertain causing serious concern. The growth of foodgrain production, in 1980-81 and 1981-82, has been less than the Plan targets. Production in 1981-82 is not much higher than the previous peak level of 131 million tonnes in 1978-79. Growth of fertiliser consumption has slowed down in the last two years. Even though consumption in 1981-82 was about 20 per cent higher than in 1978-79, there has been no visible impact on production.

There has been a decline in food stocks from the level of over 18 million tonnes in March 1979 to 10.8 million tonnes by the end of March 1982. This is a potential source of instability and it is still more disturbing since except in an exceptionally bumper year, procurement of foodgrains normally averages all the requirements of the public distribution system. The cause of this structural imbalance needs to be carefully analysed. It is necessary to review the arrangements whereby procurement has come to be looked upon merely as a price support operation. The adequacy of the available level of stocks needs to be reviewed in the light of the behaviour of monsoons in the next two months. The Department of Food should be asked to prepare a comprehensive paper on the food security system.

What really play havoc with plan objectives are the escalating costs and the inordinate delay in the implementation of plan projects. Mohammed Fazal, a member of the Planning Commission told a seminar on the power sector at New Delhi (Nov. 8, 1982) that 'project implementation delays had become a chronic malady of the Indian economy. It was necessary to get rid of this habit if the economy is to make any headway.' Referring to delays in the power sector, which were causing grave concern, particularly to the Planning Commission, he said that 'cost overruns in this sector varied from 80 per cent to 600 per cent and time overruns from 18 months to 96 months'.

TWENTY-POINT PROGRAMME

The first 20-point programme was announced on July 7, 1975 and the second, nearly seven years after on January 14, 1982. Both programmes were basically formulated with a view to ameliorate the living conditions of the rural poor. Therefore most of the plan targets which are directed at uplifting the poor have naturally found place in the 20 points. These points warrant urgent attention, but this should not mean that all the other issues raised in the Sixth Plan are of secondary importance and merit a lower priority.

The Prime Minister, Mrs. Indira Gandhi, herself declared at the recent meeting of the National Development Council (on March 14, 1982) that the 20-point programme represents "the core of the Sixth Plan". She has elaborated her point by saying that only when her 20-point programme was turned into a reality, will we be able to reach the major social and economic objectives of the Sixth Plan.

Both programmes are reproduced below:

January 14, 1982

1. Increase in irrigation potential and provision on inputs for dry land agriculture.
2. Special efforts to increase production of pulses and vegetable oilseeds.
3. Strengthening and expanding coverage of integrated rural development and national rural employment programmes.
4. Strict implementation of agricultural land ceilings and distribution of surplus land.
5. Review and effective enforcement of minimum wage for agricultural labour.
6. Rehabilitation of bonded labourers.
7. Accelerated programmes for development of Scheduled Castes and Scheduled Tribes.
8. Supply of drinking water to all problem villages.
9. Allotment of house sites to rural families and construction assistance to them.
10. Improving the environment of slums, house-building schemes for economically weaker sections and measures to arrest unwarranted increase in land prices.
11. Maximisation of power generation, electrification of villages.
12. Vigorous implementation of afforestation, social and farm forestry and development of bio-gas and other alternate energy sources.
13. Promotion of family planning on a voluntary basis as a people's movement.

14. Substantial augmentation of universal primary health care facilities and control of leprosy, TB and blindness.

15. Accelerated welfare programmes for women and children, nutrition programmes for pregnant women, nursing mothers and children, specially in tribal, hill and backward areas.

16. Spread of universal elementary education for children in the 6–14 age group with special emphasis on girls and involvement of students and voluntary agencies in the removal of adult illiteracy.

17. Expansion of the public distribution system, supply of textbooks and exercise books to students on a priority basis and promotion of a strong consumer protection movement.

18. Liberalisation of investment procedure and streamlining of industrial policies to ensure timely completion of projects, all facilities to handicrafts, handlooms, small and village industries to update technology.

19. Continued strict action against smugglers, hoarders and tax evaders and check on black money.

20. Improvement in the working of the public sector enterprises.

July 7, 1975

1. Continuance of steps to bring down prices of essential commodities; streamlined production, procurement and distribution of essential commodities, strict economy in government expenditure.

2. Implementation of agricultural land ceiling and speedier distribution of surplus land and compilation of land records.

3. Stepping up of provision of house-sites for the landless and the weaker sections.

4. Bonded labour, wherever it exists, will be declared illegal.

5. A plan for liquidation of rural indebtedness, legislation for moratorium on recovery of debts from landless labourers, small farmers and rural artisans.

6. Review of laws on minimum agricultural wages.

7. Five million more hectares to be brought under irrigation. A national programme for use of underground water.

8. An accelerated power programme. Establishment of super-thermal station under Central control.

9. New plan for development of the handloom sector.

10. Improvement in quality and supply of people's cloth.

11. Socialisation of urban and urbanisable land ceiling on ownership and possession of vacant land on the plinth area of new dwelling units.

12. Special squads for valuation of conspicuous consumption and prevention of tax evasion. Summary trials and deterrent punishment to economic offenders.

13. Special legislation for confiscation of smuggler's properties.

14. Liberalisation of investment procedures. Action against misuse of import licences.

15. New schemes for workers' association in industry.

16. National Permit Schemes for road transport.

17. Income-tax relief to the middle-class—exemption limit raised to Rs. 8000 per annum.

18. Supply of essential commodities at controlled prices to students in hostels.

19. Supply of books and stationery at controlled prices.

20. New apprenticeship schemes to enlarge employment and training, specially of the weaker sections.

108. PUBLIC FINANCE

UNION BUDGET

Federal Structure. The Indian financial system has gradually evolved on federal lines. Before 1871, the Central Government had complete control over provincial revenues and expenditure. All the revenues were credited to the Central Government and the Central Government made fixed grants to the provinces to meet their expenses. Under the Government of India Act 1919, a complete separation between Central and Provincial heads of revenue was made. Income tax and Central stamps were assigned to the Centre and Excise, Judicial stamps, Land Revenue and Irrigation were made over to the Provinces. Under the Government of India Act 1935, Income tax (excepting Agricultural Income tax) was to be collected by the Centre and a percentage of the net proceeds was to be distributed among the provinces.

The allocation of revenues between the Centre and the States has always been a contentious subject. Before the Indian Constitution came into force, this question was settled by special commissions appointed from time to time. Now, Constitution Article 280 empowers the President to appoint periodic Finance Commissions for this purpose every five years or earlier as the President deems fit.

Source of Revenue. The main source of *Union Revenue* is customs and excise duties levied by the Union Government, corporation tax and income tax, wealth tax and profits transferred from the Reserve Bank and Railways and contributions made by the Posts and Telegraphs. The main sources of revenue for the States are land revenue, sales tax, agricultural income tax, state excise duties, registration and stamp duties. The share of Union taxes and duties and grants-in-aid received from the Union constitute a substantial item in State finance.

The devolution of resources from the Union to the States is perhaps the most important feature of public finance in India. The States receive not only their share of Union taxes and duties, statutory grants and grants-in-aid, but also loans for various development schemes and for rehabilitation purposes.

Tax and Non-Tax Revenues. Non-tax revenues accrue from interest receipts, currency and mint, irrigation, electricity, public works, administrative services, and social and developmental services. The share of the non-tax revenue in the total revenues of the Union government has progressively increased from 1950-51.

Direct and Indirect Taxes. Direct taxes include taxes on income and expenditure and those on property and capital transactions. Indirect taxes cover taxes on commodity and excise levies and customs duties.

The share of indirect taxes in the total tax revenue of the Union government has been steadily on the increase since 1950–51.

The Budget. Under Art. 112 of the Constitution a statement of estimated receipts and expenditure of the Government of India has to be laid before the Parliament for every financial year—1st April to 31st March. This annual financial statement is known as Budget. The budget shows receipts and payments of the Government under three heads: (1) Consolidated Fund, (2) Contingency Fund, (3) Public Account.

Consolidated Fund includes all revenues and loans received by the Government. All expenditure from this account has to be sanctioned by Parliament.

Contingency Fund is a sum placed at the disposal of the President to meet unforeseen expenditure. Amounts spent from this Fund can be re-imbursed from the Consolidated Fund, with the sanction of the Parliament.

Public Accounts represent all receipts and payments which are in the nature of a deposit account with the Government like Provident Funds, Small Savings collections etc. No parliamentary sanction is necessary for their disbursement.

Charged Accounts. Under the Constitution certain payments like the emoluments to the President or Supreme Court Judges are on the Consolidated Account. Expenses on this account do not require Parliamentary sanction as such, but are nevertheless shown separately in the budget.

Appropriation Act. The estimates of expenditure are placed before the Lok Sabha in the form of a Demand for Grants. Ordinarily a separate demand is made for each ministry. The Appropriation Act authorises withdrawal of the estimated expenditure from the Consolidated Fund.

Finance Act embodies the tax proposals of the budget which are passed by Parliament each year.

Though the budget is prosaically described as the Annual Financial Statement, it is something more than that in the context of the Indian economy. It is the primary instrument by which plan policies are implemented. Since the plan encompasses all aspects of the national economy, the budget becomes the regulatory mechanism, which controls money supply, credit, prices, public debts, industry, imports and exports, agricultural output, savings, investments and the national income as a whole.

Revenue and Capital Budgets. Under the Constitution, Budget has to distinguish expenditure on revenue account from other expenditure. A Budget, therefore, comprises (i) Revenue Budget and (ii) Capital Budget.

Revenue Budget consists of the revenue receipts of Government (tax revenues and other revenues) and the expenditure met from these revenues. Broadly speaking, expenditure which does not result in creation of assets is treated as revenue expenditure. All grants given to State Governments and other parties are also treated as revenue expenditure.

Capital Budget consists of capital receipts and payments. The main items of capital receipts are loans raised by Government from the public which are called *Market Loans*, borrowings by government from Reserve Bank and other parties through sale of Treasury Bills (which are repayable after 91 days, but renewable), loans received from foreign Governments and bodies and recoveries of loans granted by Central Government to State Governments and other parties. Capital payments consist of capital expenditure on acquisition of assets like land, buildings, machinery equipment, as also investments in shares etc. and loans and advances granted by Central Government to State Governments, Government companies, corporations and other parties. Capital Budget also incorporates transactions in the Public account.

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On Every Rupee

Of every rupee which the finance minister will collect during the year, 17 paise will come from excise, 17 paise from customs, 8 paise from corporation tax and two paise each from income-tax and other taxes. Loan recoveries will fetch 9 paise, non-tax revenue 14 paise, market loans, capital investment bonds, small savings, provident funds and special deposits of non-government provident funds 20 paise, external loans 5 paise, and other receipts 1 paisa. Five paise has been left as deficit.

Out of every rupee thus collected, 39 paise will be spent on Sixth Plan programmes and 19 paise on other development activities. Defence will account for 17 paise, interest payments 13 paise, statutory and other transferable States and Union Territories governments 4 paise. Eight paise will be on other expenditure.

Budget 1982-83

Presenting the Budget for 1982–83 in the Lok Sabha on February 27, 1982, the Finance Minister observed that his major objective was to raise development resources without building 'new inflationary pressures'. Emphasising the need for encouraging savings, investment and production in the economy, the Finance Minister cast his net wide to raise a whopping additional Rs. 535 crores. All the same he left an uncovered gap of Rs. 1365 crores which he pointed out was "substantially lower than the estimated deficit for the current year." The deficit for 1981-82 was Rs. 2085 crores as against the revised estimate of Rs. 1700 crores.

The total receipts of the union government—non-tax revenues and capital receipts as well as the effect of changes in fare and freight rates of the railways, and in the posts and telegraphs tariff—for 1982-83 was estimated at Rs. 27,134 crores and total expenditure at Rs. 29,219 crores. The overall budgetary gap at the existing rate of taxation was Rs. 2,085 crores.

Mr. Mukherjee wielded the net wide on auxiliary duties of customs which alone will yield Rs. 290 crores. In giving concessions in direct taxes, he has gone with the principle that a reduction in tax need not lower yield. He cited the experience that despite "significant tax concessions given in the 1981-82 budget, the receipts from income tax are likely to be Rs. 1520 crores as against the budget estimates of Rs. 1444 crores".

The finance minister has stepped up the plan outlay by 21 per cent and also increased the outlay on defence from Rs. 4200 crores to Rs. 4600 crores.

Budget at a Glance

Table 89

(In crores of Rupees)

Revenue Receipts

	1981-82	*1981-82*	*1982-83*
Tax revenue	14668	15754	17614 +533*
Less–states' share of tax revenue	4131	4274	4716 + 63*
Net–centre's tax revenue	10537	11480	12698 +470*
Non–tax revenue	3790	3893	4233
Total–centre's revenue	14327	15373	17131 +470*

Table 90

(Rs. in crores)

	1981-82	*1981-82*	*1982-83*
Revenue Disbursements			
General services	4591	4588	5606
Defence services	3794	4136	4599
Social and community services	1073	1091	1253
Economic services	2961	3153	3405
Grants-in-aid to states etc.	2880	2980	3364

Total revenue disbursements	15299	15948	18227
Revenue surplus+ Deficit —	(−)972	(−)575	(−)1096 (+)470*

Table 91

Capital Receipts

Loan recoveries	1950	2240	2513
Market loans (net)	2800	2900	3200
Special bearer bonds	800	875	—
External loans (net)	1000	1060	1472
Other receipts	2455	2406	2818 +250*
Total—capital receipts	9005	9481	10003 +250*
Total receipts	23332	24854	27134 +720*
Overall deficit	1539	1700	2085 —720* 1365

Table 92

Capital Disbursements

General services	74	32	257
Defence services	406	464	501
Social and community services	203	182	185
Economic services	3403	3556	3768
Loans and advances	5486	6372	6281
Total—capital disbursements	9572	10606	10992
Total disbursements	24871	26554	29219

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* effect of budget proposals.

109. DEFENCE

Administration. The supreme command of the Armed Forces is vested in the President of India. The responsibility for national defence, however, rests with the Cabinet. All important questions having a bearing on defence are decided by the *Cabinet Committee on Political Affairs* which is presided over by the Prime Minister. The Defence Minister is responsible to the Parliament for all matters concerning Defence Services. The administrative and operational control of the Armed Forces is exercised by the Ministry of Defence and the three Services Headquarters. The Ministry of Defence acts as the central agency for ensuring a co-ordinated development of the three Services, for conveying the policy decisions of the Government of India to the three Services Headquarters for implementation and for obtaining financial sanction for defence expenditure from parliament.

Ministry of Defence. The Ministry of Defence is headed by the Minister of Defence who holds Cabinet rank. He is assisted by the Minister of State for Defence Production and the Deputy Defence Minister. The chief financial authority is the Financial Adviser to the Ministry.

The Ministry comprises four departments: (i) Department of Defence, (ii) Department of Defence Production, (iii) Department of Defence Supplies and (iv) Department of Defence Science and Research. The ministry is directly responsible for the defence of India, the provisioning and administration of the Armed Forces, namely, the Army, the Navy and the Air Force, the procurement of arms, ammunition and weapons and other items required by the Armed Forces, the location and creation of indigenous capacity for production of items hitherto imported and the promotion of research and development in the field of defence.

Control of the civilian services attached to the Ministry, formation of cantonments and delimitation of their areas and the regulation of housing accommodation for defence service personnel are among the other responsibilities of the Ministry. The main *auxiliaries* are: the *Territorial Army*, the *Coast Guards*, the *Auxiliary Air Force* and the *National Cadet Corps (NCC)*.

Defence Expenditure. Considering the size of the country and the strategic position it occupies in South Asia, India has to maintain a comparatively large Armed Force. Today India is reported to have the fourth largest army in the world, the fifth (?) largest air force and the eighth largest (?) navy. India's defence outlay has been steadily increasing. From Rs.806 crores in 1964-65, it has more than tripled to Rs. 3050 crores in 1979—80. All the same, in terms of GNP it works out to a very small percentage—around 4 per cent in 1980.

Chiefs of Staff. The Armed Forces consist of three main services, the Army, the Navy and the Air Force, each of which is headed by the Chief of Staff. The Chief of the Army Staff, the Chief of the Naval Staff and the Chief of the Air Staff constitute the Chiefs of Staff Committee. The

Chairmanship of the Committee rotates between the three Service Chiefs, according to seniority. The Committee is assisted by Sub-Committees dealing with specific problems such as planning, training, communications etc.

Army. The Army has its headquarters in New Delhi. The Chief of Staff of the Army in New Delhi is assisted by the Vice Chief of the Army Staff and five other Principal Staff Officers—Deputy Chief of the Army Staff, Adjutant General, Quartermaster General, Master-General of Ordnance, Military Secretary and the Engineer-in-Chief.

The Army is organised into five commands—Western, Eastern, Northern, Southern and Central—each under a General Officer Commanding in Chief of the rank of Lieutenant General. The Commands are divided into Areas, Independent Sub-Areas and Sub-Areas. An Area is commanded by a General Officer Commanding of the rank of Major General and an Independent Sub-Area and Sub-Area by a Brigadier.

The Army consists of a number of arms and services. These are: President's Body Guard, Armoured Corps, Regiment of Artillery, Corps of Engineers, Corps of Signals, Infantry, Army Service Corps, Military Nursing Service, Army Medical Corps, Army Dental Corps, Army Ordnance Corps, Corps of Electrical and Mechanical Engineers, Remount and Veterinary Corps, Military Farm Services, Army Education Corps, Intelligence Corps, Corps of Military Police, Army Physical Training Corps, Pioneer Corps, Army Postal Service Corps and Defence Security Corps.

The sanctioned strength of all ranks of the Army is 8.5 lakhs.

Territorial Army. Territorial Army is a voluntary part-time citizens' force consisting of persons who are not professional soldiers but civilians who are eager to play a role in the defence of the country. All Indian nationals between 18 and 35 years of age are eligible to join it. T. A. in 1980 comprised infantry, engineering and medical units.

National Cadet Corps (NCC) is a youth organisation, open to students of academic institutions. It aims at development of leadership qualities, character and the spirit of sportsmanship and service. It is a voluntary organisation and neither officers nor cadets are under obligation to enter active military service.

NCC consists of 3 divisions, Senio Junior & Girls. The authorised strength the senior division is 4 lakhs, the Junio division 7 lakhs and Girls 62,000 among the three wings of the Armed Forces.

Navy. The Naval headquarters are in New Delhi. The Chief of Naval Staff in New Delhi is assisted by 4 Principal Staff Officers, namely, the Vice Chief of the Naval Staff, Chief of Personnel, Chief of Material and Deputy Chief of the Nav Staff.

The Navy is organised into three Nava Commands under Flag Officers Commanding-in-chief: Western Naval Command with headquarters at Bombay, Eastern Nava Command with headquarters at Vishakhapatnam and Southern Naval Command with headquarters at Cochin.

The Navy has two Fleets—the Western Fleet and the Eastern Fleet. The two Fleets consist of the aircraft-carrier *INS Vikrant*, two cruisers, a number of frigate squadrons, including some of the latest types of anti-submarine and anti-aircraft frigates, a squadron of anti-submarine patrol vessels, one mine-sweeping squadron, submarines, a submarine depot ship and fast vessels carrying surface-to-surface guided missiles. The Navy has a sizeable air wing with various types of fixed wing aircraft and helicopters. Besides, there are some survey ships, two fleet tankers and a number of auxiliary craft. The survey units of the Navy carry out a survey of India's coast and approaches to the harbours. A naval organisation is functioning at Port Blair to ensure the security of the Bay Islands. The Navy took over the responsibilities for Maritime Reconnaissance from the I. A. F. and has acquired some MR aircraft for the purpose.

Since 1964, India has been building her own naval ships and craft. Four Leander class frigates, *INS Nilgiri, Himgiri, Udaygiri* and *Dunagiri*, a Survey Ship, Minesweepers, Seaward Defence Boats, besides Harbour Utility and Ocean-going Tugs have already been commissioned. Seaward Defence Boats, Survey Ships, Landing Craft and a number of auxiliary vessels are under construction. The sixth and the last of the Leander class frigates I. N. S. Vindhyagiri was commissioned in 1981-82.

Coast Guards. The Coast Guards initially constituted in 1977, became a permanent part of the Navy under the Coast Guard Act, 1978. The coast guard is headed by a Director General at Delhi. It has 3 regional headquarters--Bombay (western region)

Madras (southern region) and Port Blair (Andaman & Nicobar)

The main duty of the Coast Guard is to ensure the safety and protection of offshore installations, terminals etc. and to safeguard the maritime environment from pollution.

Air Force. The Indian Air Force is organised into five Commands and an independent Operational Group. These are: Western Air Command, Central Air Command, Eastern Air Command, Training Command, Maintenance Command and No. 1 (Opl.) Group.

At the Air Headquarters in New Delhi, the Chief of the Air Staff is assisted by four Principal Staff Officers, namely, Vice Chief of the Air Staff, Deputy Chief of the Air Staff, Air Officer-in-Charge, Administration, and Air Officer-in-Charge, Maintenance. Each of them controls a group of Directorates.

At the time of partition (1947) India's share in the IAF totalled 9½ squadrons. In 1982 India had 35 combat squadrons and 10 other squadrons of transport aircraft and helicopters. The development of the IAF has not only been balanced but also up-to-date. Jaguar, the latest acquisition of the IAF is a deep penetration aircraft with a modern navigation system and all-weather capability. AN 32, a modern transport aircraft is to replace the old aircraft like the Caribou, Packets and Dakotas. They will be acquired next year. Miraj 2000 is another sophisticated aircraft which the IAF thinks of acquiring. In missiles, the IAF has a complete range of radar-guided weaponry which can be fired night and day with the utmost accuracy.

Subcontinental Military Balance. The military forces of Pakistan, India and Bangladesh as published in the Military Balance (1980-81) of the International Institute for Strategic Studies, London are as follows:—

	Pakistan	*India*	*Bangladesh*
Army	408000	944000	65000
Corps	6	6	—
Armoured divisions	2	2	—
Infantry divisions	16	17	5
Mounted divisions	—	10	—
Independent Armoured Brigades	4	5	1 (2 armoured regiments)
Independent Infantry Brigades	4	1	30
Tanks	1065	2170	—
Armoured personnel carriers	550	700	—
Artillery pieces	100	2000	85
Reserves	500000	240000	—
Air Force	17000 men	113000 men	3000 men
Combat aircraft	256	630	27
Combat Squadrons	14	35	2
Transport Squadrons	2	12	1
Navy	13000 personnel	40700 personnel	4000 personnel
Submarines	6 submarines	8F class submarines	—
Midget submarines	5	—	—
Aircraft Carrier	—	1	—
Missile destroyer	—	1	—
Frigates	7	29	2
Corvettes with missiles	—	4	—
Missile boats	—	16	—
Patrol craft	3	6	—
Mine Sweepers	7	11	—

Commissioned Ranks. The following are the commissioned ranks in the three Services; each rank is shown opposite to its equivalent in the other Services.

Army	*Navy*	*Air Force*
General	Admiral	Air Chief Marshal
Lieutenant-General	Vice-Admiral	Air Marshal
Major-General	Rear-Admiral	Air-Vice Marshal
Brigadier	Commodore	Air-Commodore
Colonel	Captain	Group Captain
Lieutenant-Colonel	Commander	Wing Commander
Major	Lieutenant-Commander	Squadron Leader
Captain	Lieutenant	Flight-Lieutenant
Lieutenant	Sub-Lieutenant	Flying Officer
Second Lieutenant	Acting Sub-Lieutenant	Pilot Officer

Inter-Services Organisation. In matters like medical services, public relations, etc. which are common to all the three Services, the Army, the Navy and the Air Force are served by Inter-Services Organisations which function directly under the Ministry of Defence. The important Organisations are:

(i) Armed Forces Film and Photo Division.
(ii) Armed Forces Medical Services.
(iii) Defence Lands & Cantonments.
(iv) Directorate of Public Relations.
(v) Historical Section.
(vi) Joint Cipher Bureau.
(vii) Ministry of Defence Library.
(viii) National Defence College.
(ix) Services Sports Control Board.
(x) Videshi Bhasha Vidyalaya.

Armed Forces Medical Services comprise Army Medical Corps, Army Dental Corps and Military Nursing Service, under the overall control of Director General, Armed Forces Medical Services.

Armed Forces Medical College, Pune. trains civilian candidates for the MBBS course of Pune University. 100 boys and 20 girls are admitted every year. Candidates who receive stipends number 60. They have to serve as Permanent Commissioned Officers. Post-graduate specialised courses are also provided at Pune. Training in medical problems peculiar to airmen is given at the *Institute of Aviation Medicine* at Bangalore and those peculiar to seamen at the *Institute of Naval Medicine*, Bombay.

Cantonments were established under the Cantonments Act, 1924 with the purpose of accommodating Armed Forces personnel and safeguarding their health, welfare and security. Since the Cantonments included a significant civilian population, it was found necessary to provide for local self-government for these areas. The Cantonment Boards formed under the Cantonments Act, 1924 look after the municipal administration in their areas under the Central Government. These Boards are responsible for providing civil services to the community and for looking after their welfare. There are 62 Cantonments in India.

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Last Batch of Jaguars

The last batch of the Jaguar deep penetration strike aircraft has reached India.

With this Britain has completed the supply of 40 Jaguars to the Indian Air Force as contracted.

The IAF has now two operational squadrons of Jaguars. The first two aircraft were received in July 1979. They heralded a new era providing India's air arm with the long-awaited long-range strike capability.

NEW DELHI, Nov. 30, 1982 (UNI)

Defence Production. The Defence production activities are broadly divided in two groups, namely, departmentally-run Ordnance Factories under the control of Director General of Ordnance Factories and Defence Public Sector Undertakings. Whereas the arms, ammunition, tanks, vehicles etc. are manufactured in the Ordnance Factories, the Defence Public Sector Undertakings are geared to take on the production of aircraft, ships, earth-moving equipment, machine tools, electronics, missiles etc. The Ordnance Factories and the Defence PSUs have a continuous programme of indigenisation.

Public Sector Undertakings. There are at present 9 public sector undertakings under the administrative control of Ministry of Defence (Department of Defence Production). Out of them, 8 undertakings, viz., Hindustan Aeronautics Ltd. (HAL), Bharat Electronics Ltd. (BEL), Bharat Earth Movers Ltd. (BEML), Mazagon Dock Ltd. (MDL), Garden Reach Ship-builders & Engineers Ltd. (GRSE), Goa Shipyards Ltd. (GSL), Praga Tools Ltd. (PTL) and Bharat Dynamics Ltd. (BDL) are currently in production. The ninth undertaking—Mishra Dhatu Nigam Ltd. (MDNL)—which is being set up, will start manufacture of super alloys and special metals required by aeronautics, space and electronics industries.

The total strength of employees of the Defence Public Sector undertakings as on 31-12-1978 was about 95,000.

Research & Development. The research and development activities are carried out in 35 main Laboratories/Establishments and a few field units located in different parts of the country.

The Organisation is headed by the Director General Research and Development (DGR&D) who is also the Secretary to the Government of India for Defence Research. He is assisted by three Chief Controllers.

The budget and manpower of Defence Research and Development Organisation has grown progressively over the last few years. The organisation has at present an authorised strength of about 3600 civilian and service scientists and technologists and about 20,000 supporting non-gazetted scientific staff, industrial, administrative and other categories. The R & D budget has practically doubled itself between 1961-62 and 1975-76 growing from about 1 per cent to 2 per cent of the total defence budget.

RANKS AND BADGES

(All Services)

ARMY

Ranks	*Badges—Shoulder*
Junior Officers:	
2nd Lieutenant	1 Star
Lieutenant	2 Stars
Captain	3 Stars
Senior Officers:	
Major	1 National Emblem
Lt. Colonel	1 National Emblem, 1 Star
Colonel	1 National Emblem, 2 Stars
General Officers:	
Brigadier	1 National Emblem, 3 Stars
Major General	Cross sword and baton with a star above
Lt. General	Cross sword and national emblem above
J. C. Os:	
Subedar Major	½" red braid with yellow in the middle and national emblem above.
Subedar	½" red braid with yellow in the middle and 2 stars above

NAVY

Junior Officers:	
Actg. Sub Lieutenant	1 row of ½" braid with a loop on the top
Sub Lieutenant	1 row of 9/16" braid with a loop on the top
Lieutenant	2 rows of 9/16" braid with a loop on the top
Senior Officers:	
Lt. Commander	2 rows of 9/16" braid with a loop on the top and row of ¼" braid in between.
Commander	3 rows of 9/16" braid with a loop on the top
Captain, over 3 years	4 rows of 9/16" braid with a loop
Flag Officers:	
Commander 2nd Class	2" braid with a loop
Commander 1st Class	2" braid with a loop and 1 row of 9/16" braid
Rear Admiral	1 band of 2" braid and 1 row of 9/16" braid with a loop above
Vice Admiral	A band of 2" braid with 2 rows of 9/16" braid with a loop above.
Admiral	A band of 2" with 3 rows of 9/16" braid with a loop above, with a loop on the top.

AIR—FORCE

Junior Officers:	
Pilot Officer	A ring of ¼" braid
Flying Officer	A ring of 9/16" braid
Flight Lieutenant	2 rings of 9/16" braid
Senior Officers:	
Squadron Leader	2 rows 9/16" braid
Wing Commander	¼" braid in between 3 rows of 9/16" braid
Group Captain	4 rows of 9/16" braid
Air Officers:	
Air Commodore	A band of 2" braid
Air Vice Marshal	A band of 2" braid with one row of 9/16" braid above
Air Marshal	A band of 2" braid above with 2 rows of 9/16" braid above

110. CURRENCY AND EXCHANGE

Indian Currency. The Indian Currency System was converted into the decimal system by the Indian Coinage (Amendment) Act, 1955. The amended Act was brought into force only on April 1, 1957.

With the amendment of the Indian Coinage Act, the old system of *rupees, annas, pies (1 rupee=16 annas, 1 anna=12 pies)* was replaced by the *rupee-paise* system and the intermediate coin *anna* was abolished.

The first one-*paise* coin under the decimal system was issued in March 1962 and the first one-*rupee* coin in July 1962. From Oct. 1, 1964 the one-digit denominations of one-paise (1p.) and two-paise (2p.) coins were supplemented by the issue of three-paise (3p.) coins.

Story of the Rupee. The Rupee was first minted in India during the reign of Sher Shah around 1542. It was a silver coin weighing 179 grams of pure silver. The Rupee soon displaced the old gold coins and became the standard currency in India and a currency of repute outside India. The English East India Company adopted the Rupee as their currency in India. The East India Rupee coin was 180 grams of 11/12 fine silver. It was exchanged for 2 shillings. This exchange value, namely Rs. 10 per pound, continued up to 1873.

After 1873 when the price of silver fell in the world market the Rupee lost in metallic value. Consequently its exchange value came down to 1 shilling. The British rulers stopped minting Rupees and fixed the value of the Rupee coins (already in circulation) at 1s. 4d. or Rs. 15 to the gold sovereign. Both gold sovereigns and silver rupees continued in circulation in India till 1917.

After the First World War, in 1920 the value of the Rupee was fixed at 2 shillings gold. Since the pound sterling (Currency note) was lower in value than the gold pound, the value of the Rupee remained higher than 2 shillings in terms of the pound sterling. As no rate was fixed for Rupee–Sterling exchange, it kept on changing. In 1927 the Rupee-Sterling rate was officially fixed at 1s. 6d. sterling.

In 1931, when Britain abandoned the gold standard there was no longer any complication regarding gold values and the Rupee came to be valued solely in sterling. The establishment of the Reserve Bank of India in 1935 changed the status of the Rupee. It became an independent currency although for exchange purposes it continued to be dependent on sterling.

During the Second World War, Rupee notes were freely printed in India to pay for British war expenses and the Rupee depreciated greatly. But the Rupee–Sterling exchange was rigidly maintained at 1s. 6d. India accumulated a lot of export surplus with Britain on account of war supplies. This surplus remained tied up in London as India's sterling balance.

In March 1947 India became a member of the International Monetary Fund (IMF) and the exchange value of the Rupee came to be fixed by IMF standards. But with prices moving upwards, India was obliged to devalue the Rupee by 30.5 per cent on Sept. 18, 1949.

From 1955 onwards the Rupee was fighting a battle for survival against the ever-rising domestic prices. It started losing its value steadily both in the home market and in the international market. This led to a second devaluation of the Rupee by 57 per cent on June 6, 1966. But the devaluation did not stop the rot. The Rupee continued to fall.

In 1971, the *almighty* dollar buckled under international monetary pressure. It ceased to be convertible in gold. This upset the entire international exchange

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Re. devalued

The pound sterling has become five paise costlier following a 0.3 per cent devaluation of the rupee in terms of the basket announced by the Reserve Bank of India (RBI) today, reports UNI.

With this revision, the 75th this year, the middle rate has gone up to Rs. 16.55 per pound against the earlier Rs. 16.50.

The new spot rates are: buying 6.0568 pounds per Rs. 100, corresponding to Rs. 16.51 per pound, selling 6.0277 pounds per Rs. 100 corresponding to Rs. 16.59 per pound.

News Report, Oct. 12, 1982.

system. With the fall of the dollar, many countries de-linked their currencies from gold. Many currencies floated freely in the international market following the fortunes of trade.

The Rupee still remained linked to the pound though the pound itself was fighting a losing battle to maintain its value. On June 23, 1972, the pound cast off all moorings and joined the array of floating currencies.

When the pound sterling was floated in June 1972 no significant change occurred in Indian foreign exchange system, except for the small upward adjustment in the Reserve Bank's rates for spot purchase and sales of sterling from/to authorised dealers.

On Feb. 16, 1973, the Union Cabinet decided to maintain the existing central rate (fixed on Dec. 20, 1971) between the Indian Rupee and the Pound Sterling at Rs. 18.0677 with the Reserve Bank buying or selling with margins of 2.25 per cent either way.

The Indian rupee was floating on the exchange, along with the pound. The exchange value of the rupee was derived from the cross-rate between the floating pound and other currencies on the one hand and the fixed rupee-sterling rate on the other.

Remaining linked to the pound meant that the Rupee had to endure not only its own troubles but the troubles of the pound sterling as well. And the pound showed no signs of coming up. It was sinking deeper and deeper into the quicksands of international exchange.

On Sept, 24, 1975 the Government of India decided to de-link the Rupee from the ailing pound and to adopt a basket of currencies instead. The exchange value of the Rupee was thus determined in relation to a 'weighted' average of the currencies of India's leading trade partners.

Since the delinking of the rupee from the pound sterling and the switchover of the rupee to the basket of currencies in September 1975, there have been as many

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Demonetisation

There have been two demonetisations in India in recent times, the first in Jan. 1946 and the second in January 1978. In 1946 two ordinances were issued on January 12 the **Bank notes (Declaration of holdings) Ordinance 1946 and Bank notes (Demonetisation) Ordinance, 1946**. *These Ordinances applied only to British India but princely States in India were also persuaded to issue parallel demonetisation Ordinances in their States, so that demonetisation would take effect all over India. The first ordinance called for a declaration of all notes of the value of Rs. 100 and above. The second ordinance demonetised all notes of the value of Rs. 500 and above.*

The Indian States which did not issue ordinances demonetising high denomination currency notes were required to exchange their holdings of demonetised notes before the 7th March, 1946.

The total value of high denomination notes exchanged by 31st March 1946 was Rs. 123.37 crores of which as much as Rs. 109.67 crores were exchanged before 26th January 1946, i. e. within a fortnight of the issue of the Ordinance.

The second demonetisation *was promulgated on the night of January 16, 1978. This demonetisation, however, affected only notes of the value of Rs. 1000, 5000, and 10000 while the 1946 demonetisation covered notes of the value of Rs. 500 as well.*

Demonetisation proceedings are intended more as psychological deterrents to black market or unaccounted money operations than as actual traps to ambush black market currency. High denomination notes do not cover any significant portion of Indian currency. These notes, that is, notes above the value of 100 Rupees, account for only about 2 per cent of the notes in circulation. The Reserve Bank estimates that the total value of high denomination notes (above Rs. 100) which were demonetised in 1978 came only to Rs. 147 crores out of Rs. 8378 crores which was the total value of all notes in circulation at the end of March, 1977.

as 16 revisions—ten upward revisions and six downward revisions—in the rupee-sterling exchange rates till October 30, 1978. The net result of these revisions was that the value of the rupee rose 11.7 per cent higher in Dec. 1978 in relation to pound sterling than it was three years ago on September 24, 1975.

Exchange Value of Rupee. During 1978 –79 the international currency market was characterised by wide fluctuations in the exchange rates of several major currencies. With a view to imparting a measure of stability to the exchange rate of the rupee and our international transactions, the Government of India reviewed the exchange rate arrangements under which the exchange rate of the rupee is determined with reference to exchange rate movements of a selected number of currencies of countries which are India's major trading partners.

According to the Order issued by Reserve Bank of India, effective 30th January 1979, the value of the Indian rupee was to be maintained within a wider margin of 5 *per cent* (as against the earlier margin of 2.25 *per cent*) on either side in terms of a suitably weighted currency basket. Pound Sterling will continue to be the intervention currency and the Reserve Bank will fix the buying and selling rates for the pound sterling, adjusting them from time to time in conformity with the above policy. The Rupee ended on a strong note as the calendar year 1979 closed.

As in the past few years, the value of the Indian Rupee continued to be linked to a suitably weighted basket of currencies of countries which are India's major trading partners. Under the above arrangement, the value of the Rupee on 30th November, 1981 stands adjusted upwards by 3.35 per cent against the Pound Sterling and down ward by 9.89 per cent against US dollar compared to the position on April 1, 1981.

Foreign Exchange Reserves. The improvement in India's foreign exchange reserves which was marked in 1976–77 and 1977–78, slackened from the year 1978-79. As against the accretion to the foreign exchange reserves of Rs. 1371.29 crores in 1976–77 and Rs. 1636.76 crores in 1977–78, the increase in 1978–79 was only Rs. 720.11 crores and in 1979–80, the reserves declined by Rs. 56.20 crores. This declining trend in foreign exchange reserves continued during 1980–81 and 1981-82. The reserves declined by Rs. 341.54 crores in 1980–81 and the draw down continued in 1981–82 and by the end of November, 1981 these had come down by Rs. 1056.69 crores from the level obtaining on April 1, 1981.

During the period April to November, 1981, the value of gold holdings remained at Rs. 225.58 crores. The SDR holdings as on the 30th November, 1981 amounted to SDR 468.32 million equivalent to Rs. 469.43 crores, indicating a decrease of SDR 22.18 million equivalent to Rs. 27.31 crores during April–November, 1981.

111. CENTRAL BANKING

A regular central banking system for the country was first instituted under the Reserve Bank of India Act, 1934. Until then the Imperial Bank of India functioned as a central bank of sorts. But beyond acting as bankers to the government, the Imperial Bank did little else as a central bank.

Reserve Bank of India. The Reserve Bank came into existence on April 1, 1935. The Bank was originally constituted as a share-holders' bank, but was later converted into a State-owned bank by the Reserve Bank (Transfer to Public Ownership) Act, 1948. The Reserve Bank is divided into two distinct and separate departments, the *Issue department* and the *Banking department*. In addition to these, there is an agricultural credit department, which maintains an expert staff to study all questions of agricultural credit.

The primary functions of the Reserve Bank are: (1) Issue of paper currency, (2) Acting as bankers to Government including raising of public loans and management of public debt, (3) Controlling the activities of commercial banks, (4) Acting as a bank of accommodation and a lender in the last resort, (5) Maintenance of the external value of the rupee, (6) Provision of agricultural credit, (7) Collection and publication of monetary and financial information.

Scheduled and Non-Scheduled Banks. Under the Reserve Bank of India Act, the joint-stock banks in India were classified as Scheduled and Non-scheduled banks. Scheduled Banks are those with a minimum capital and reserves of Rs. 5 lakhs, who having satisfied the Reserve Bank that their affairs are not being conducted in a manner detrimental to the interests of the depositors, are included in the Second Schedule to the Reserve Bank of India Act, 1934.

Non-Scheduled Banks are divided into four categories according to their capital: (1) A, with a capital of 5 lakhs and over, (2) B, with a capital between 1 and 5 lakhs, (3) C, with a capital between 50,000 and 1 lakh and (4) D, with a capital of less than 50,000.

Role of the Reserve Bank. The Reserve Bank's role in the Indian economy is dual —promotional and regulatory. In recent years, its promotional role has been more predominant than the regulatory role. It has helped the Government in its development projects by raising loans at fairly low interest and by providing funds for deficit financing. In developing the money market and the capital market, the Reserve Bank's promotional role has been exceptional. In its regulatory role, the Reserve Bank's monetary policy has been oriented to the national objective of economic growth with stability. Even though the conventional weapons of a central bank have only a limited operation in regulating the monetary system, the selective credit control and other directives issued by the Reserve Bank have had a salutary effect on the economy.

Affiliates. The following institution are affiliates of the Reserve Bank: (i) *Agricultural Refinance Corporation*, (ii) *Deposit Insurance Corporation* and (iii) *Unit Trust of India*.

The Industrial Development Bank of India (IDBI), originally established in 1964 as an affiliate of the Reserve Bank, was statutorily de-linked from the Reserve Bank in February, 1974.

Legislative Changes. A series of amending acts in 1962, 1963 and 1974 have expanded the jurisdiction and powers of the Reserve Bank, as a banker's bank and the custodian of national credit, even by bringing non-banking companies which receive deposits under its control and supervision.

The Reserve Bank of India (Amendment) Act, 1974, has (i) widened the powers of the Bank to provide refinance facilities to scheduled banks and state co-operative banks, (ii) enlarged the scope of the term "agricultural operations" so as to permit extension of concessional refinance facilities by the Bank to apex co-operative banks in respect of loans to co-operatives exclusively formed for subsidiary activities undertaken not jointly but independently of farming, (iii) widened the scope of the Bank to act as agent so as to enable the Bank to issue and manage bonds and debentures on behalf of statutory corporations like the Agricultural Refinance Corporation and the Industrial Development Bank of India, (iv) enlarged the list of foreign securities eligible to be held as assets of the Issue Department of the Bank, (v) modified the definition of the term "liabilities" in the explanation below sub-section (1) of Section 42 of the Reserve Bank of India Act, 1934, (vi) provided statutory protection to banks to exchange freely credit information mutually among themselves and (vii) vested the Bank with better powers to exercise control over non-banking institutions receiving deposits.

The Interest Tax Act, which came into operation in Sept. 1974, levied a tax at the rate of 7 per cent on interest earnings of the scheduled banks with effect from the assessment year 1975–76.

The Act was suspended in 1978–79 but has been revived in 1980–81 and extended to term lending institutions like the Industrial Corporation of India.

The Reserve Bank of India Amendment Act, 1978. The Reserve Bank of India (Amendment) Act, 1978, came into force from July, 1978.

Briefly, the amendments empower the Reserve Bank to open gold accounts abroad, invest in securities guaranteed by a foreign government, open accounts with branches of Indian banks abroad and invest in the shares and securities of an international or regional bank or financial institutions formed by foreign governments or principal currency authorities.

The amended Act also empowers the Reserve Bank to make rupee loans to scheduled banks and certain specified financial institutions to enable them to purchase foreign exchange from the Reserve Bank for financing import of capital goods and for other approved purposes.

The existing stipulation that the Reserve Bank's purchases from or sale to scheduled banks of foreign exchange should be in amounts of not less than the equivalent of one lakh rupees has been removed.

Credit Policy 1981-82. The credit policy which was one of restraint since end-November, 1978 had to be made more stringent during 1981-82. A number of measures were taken by the Reserve Bank aimed at controlling non-food credit expansion and mopping up excess liquidity in the banking system. Despite credit restraint, banks were urged to extend adequate credit support to the priority sectors and exports, to meet the genuine requirements of production and public distribution system and to give special attention to the needs of beneficiaries of the 20-Point Programme.

The Reserve Bank introduced many changes in the existing credit policy measures with a view to reducing the excess liquidity in the economy. The Bank rate was raised from 9% to 10% from July 11, 1981 and the statutory liquidity ratio from 34 per cent to 35 per cent of the total Demand and Time liabilities.

The ceiling rate of interest on bills rediscounted by banks with other commercial banks and approved financial institutions which was 10 per cent since March 1, 1978 was raised by the Reserve Bank to 11.5 per cent from September 1, 1981.

In view of the overall increase in the interest rates in the past three years, and in particular, the increase in the interest rates on Government securities, the Reserve Bank raised the interest rate paid on cash reserves maintained with it by commercial banks. Effective June 1, 1981, cash reserves above the statutory minimum of 3 per cent attracted interest at 7 per cent, as against 6.5 per cent earlier.

112. COMMERCIAL BANKING

Modern Indian banking originated in the presidency towns of Bombay, Calcutta and Madras. These towns were not only the headquarters of the British Presidencies of Bombay, Bengal and Madras but also the principal British trading centres in India. The British trading houses who carried on business in the presidency towns first started banking as an ancillary of trade. Most of these trading-cum-banking houses came to grief between 1829 and 1832 owing to their participation in speculative trade. Some firms like Grindlays, however, survived and continued to carry on trade and banking together.

Presidency Banks. The Presidency Banks functioned as bankers to the East India Company at Calcutta, Bombay and Madras. They gradually took over the banking business of the British Agency houses. The first Presidency Bank to be established was the Bank of Calcutta in 1806. It was renamed the Bank of Bengal in 1809. The Bank of Bombay was established in 1840. This bank got itself involved in speculation and was replaced by a second Bank of Bombay in 1868. The Bank of Madras was established in 1843. These three banks were amalgamated to form the Imperial Bank of India which started functioning on January 27, 1921. The Imperial Bank functioned as bankers to the Government of India and the provincial governments and at the same time carried on commercial banking. In 1955 the Imperial Bank of India was re-constituted as the State Bank of India and converted into a purely commercial bank, covering the whole of India.

Joint-Stock Banking. Meanwhile, in 1860 the principle of joint-stock banking with limited liability was recognised by the Government of India. This opened the way for the emergence of private commercial banks with limited liability. The Bank of Upper India was formed in 1863 and the Allahabad Bank in 1865. By 1894, there were 14 joint-stock banks in India, most of them run by Europeans.

In 1894, the Punjab National Bank, a purely Indian concern, came into being. Other banks followed. Some new banks like the Bank of Burma and the Indian Specie Bank, which were established mainly for foreign exchange business, did not survive long. But many others survived —the Bank of India, established in 1906, the Bank of Baroda (1908) and the Central Bank of India (1911). Close on the heels of these big banks, various smaller banks were started in different parts of India. Many of these smaller banks died during the First World War.

With the end of the War, India witnessed a new spate of banking ventures. The great majority of these new banks were wiped out during the great depression of the thirties.

The Travancore National & Quilon Bank Ltd. (in the princely State of Travancore), one of the banks that outlived the depression, fell a victim to a political vendetta and was compulsorily liquidated in 1938. This started a chain reaction, leading to the closure of as many as 64 banks all over India. Indian joint-stock banking has thereafter progressed without serious setbacks.

In 1955, the Imperial Bank of India was nationalised and re-named the State Bank of India. In 1959-60 the State Bank took over as subsidiaries 7 provincial banks which were originally started as State Banks of the princely States of Hyderabad, Bikaner, Jaipur, Indore, Travancore, Saurashtra, Mysore and Patiala. With this takeover, the State Bank of India emerged as the colossus of Indian banking, with a network of nearly 2500 branches all over India.

The successful absorption of many smaller banks by the State Bank of India set off a movement in political circles for the total nationalisation of banking. There was much to be said against the big commercial banks. They were concentrated in cities and major towns and catered only to big trading and industrial houses. They had no branches in the villages, where the majority of the Indian population lived. They paid no attention to small industries. In point of fact, agricultural advances of the commercial banks fell from a 2.3 per cent of their total credit in 1951 to a mere 0.2 per cent in 1966.

Social Control of Banks. The idea of a social control of banks was a compromise worked out at the Faridabad session of the Indian National Congress in April 1968, between the out-and-out champions of nationalisation of banking and the conservative section advocating a go-slow policy. Social control of banks was given effect to by legislation on Feb. 1, 1969. The object of the legislation generally was to bring in *socialisation of credit without nationalisation* of banks. This involved the prevention of the exclusive use of bank credit by big business houses and a wider dispersal of credit, so as to direct its flow to priority areas and make it a live instrument of development.

It must be said to the credit of the commercial banks that they acted up to the ideal of social control, long before it materialised into law. They had reconstituted their Boards of Management and realigned their credit schemes.

Nationalisation of Banks. Despite all enthusiasm evinced by the banking community to implement the objectives of social control, the idea was abandoned overnight, as it were, and 14 leading banks of the country were nationalised by a Presidential Ordinance on July 19, 1969. The ordinance became law by the *Banking Companies (Acquisition and Transfer of Undertaking) Act. 1969.* This was declared unconstitutional by the Supreme Court on February 10, 1970. On February, 14, 1970, the President issued a validating ordinance, re-nationalising the 14 banks with retrospective effect from July 19, 1969. This ordinance rectified the irregularities pointed out by the Supreme Court and was enacted into law as the *Banking Companies (Acquisition and Transfer of Undertaking) Act, 1970.*

The leading commercial banks, on the eve of nationalisation, numbered fourteen, the oldest being the Allahabad Bank and the biggest, the Central Bank of India.

Table 93

Nationalised Banks Basic Data as on 31 December, 1968

Bank	*Year of establishment*	*Number of offices*	*Deposits and other accounts (Rs. crores)*	*Bills discounted and purchased (Rs. crores)*	*Loans and advances (Rs. crores)*	*Bank credit (Rs. crores)*	*Credit as per cent of deposits*
Central Bank of India	1911	504	433	55	241	296	68.4
Bank of India	1906	250	395	34	219	253	64.1
Punjab National Bank	1894	544	356	34	175	209	58.7
Bank of Baroda	1908	333	314	30	166	196	62.4
United Commercial Bank	1943	223	241	39	105	144	59.8
Canara Bank	1906	302	146	23	74	97	66.4
United Bank of India	1950	178	144	14	86	100	69.4
Dena Bank	1938	214	122	15	59	74	60.7
Union Bank of India	1919	213	115	18	51	69	60.0
Allahabad Bank	1865	128	113	7	63	70	61.9
Syndicate Bank	1925	254	112	12	59	71	63.4
Indian Overseas Bank	1936	188	93	24	34	58	62.4
Indian Bank	1907	190	85	14	43	57	67.1
Bank of Maharashtra	1935	140	73	4	46	50	68.6
Total		3761	2742	323	1421	1744	63.5

Six More Banks Nationalised. On April 15, 1980 the President promulgated an Ordinance—*The Banking Companies (Acquisition & Transfer of Undertaking) Ordinance, 1980*—under which 6 leading commercial banks, each with deposits of Rs. 200 crores and above, were nationalised. They are (1) Andhra Bank, (2) Corporation Bank, (3) New Bank of India, (4) Oriental Bank of Commerce, (5) Punjab & Sind Bank and (6) Vijaya Bank. The nationalised commercial banks now numbered 20.

An official release said that the total demand and time liabilities of these banks on March 14 amounted to over Rs. 2356 crores.

The ordinance declared that the undertaking of each of the existing banks shall be transferred to and shall vest in a corresponding new bank which will be a new body corporate with a separate identity.

Owned funds for each of the six banks and the compensation announced by the government are indicated in the table below:

Table 94

Owned Funds & Compensation

(six nationalised banks)

Name of the Bank	*Owned funds (+) (Rs. crores)*	*Paid up value per share (Rs.)*	*Market value per share (Rs.)*	*Book value per share (+) (Rs.)*	*Compensation (Rs. crores)*
Andhra Bank	3.98	100	116	98.39	6.10
Corporation Bank	1.77	50	56	131.62	1.80
New Bank of India	3.86	5	10	25.50	5.10
Oriental Bank of Commerce	1.01	5	N.Q.	23.13	1.00
Punjab & Sind Bank	1.75	50	75	151.02	2.10
Vijaya Bank	2.85	25	N.Q.	60.60	2.40

N. Q.—not quoted.

State Bank of India. The State Bank of India is the successor of the Imperial Bank of India. The establishment of the Reserve Bank of India in 1934 necessitated a change in the status of the Imperial Bank. This was done by the *Imperial Bank of India (Amendment) Act, 1934*. By this amendment, the Imperial Bank lost its status as a central bank but remained the sole agent of the Reserve Bank, where the latter had no offices of its own. At the same time, the Imperial Bank was given all freedom to function as a commercial bank and to enter into foreign exchange business.

The primary purpose in reconstituting the Imperial Bank as the State Bank of India was to convert the Imperial Bank as one strong integrated State-partnered commercial banking institution with branches all over the country so as to serve the needs of rural credit and generally to promote commercial banking on sound lines throughout India. The State Bank functions as the sole agent of the Reserve Bank, wherever the former has branches and where the Reserve Bank has no banking departments.

Subsidiary Banks. Under the *State Bank of India (Subsidiary Banks) Act, 1959*, the State Bank took over the control of the following 8 banks:

Table 95

Subsidiary Banks

	Established in	*Constituted as State Bank's Subsidiary*	*Name of the Subsidiary*
Hyderabad State Bank	1942	1-10-1959	State Bank of Hyderabad
Bank of Jaipur	1943	1- 1-1960	State Bank of Jaipur†
Bank of Bikaner Ltd.	1944	1- 1-1960	State Bank of Bikaner
Bank of Indore Ltd.	1920	1- 1-1960	State Bank of Indore
Travancore Bank Ltd.	1940	1- 1-1960	State Bank of Travancore
Bank of Mysore Ltd.	1913	1- 3-1960	State Bank of Mysore
Bank of Patilala.	1917	1- 4-1960	State Bank of Patiala
State Bank of Saurashtra (formerly known as Bhavnagar Darbar Bank)	1902	1- 5-1960	State Bank of Saurashtra

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† State Bank of Jaipur subsequently merged with State Bank of Bikaner with effect from 1-1-1963 and the new subsidiary was renamed as 'State Bank of Bikaner and Jaipur'.

Public Sector Banks. The State Bank of India, its 7 subsidiaries, the 14 banks nationalised in 1968 and the 6 banks nationalised in 1980 are now collectively called Public Sector Banks.

New Banking Policy. The main objective of the nationalisation of the leading commercial banks was to initiate a new banking policy. The new policy aimed at re-channelling bank credit from big industries to small sectors or as R.K. Talwar, the then Chairman of the State Bank of India, put it "to the small man in business, industry and agriculture." The new policy called for many innovations. In the first place, "the small men" were scattered all over the country. They had to be identified and reached. This meant that banks should branch out into every nook and corner of India.

The new policy involved a right-about turn for the old commercial banks. They had to discard their urban and elitist outlook and become ruralised and mass-based. The banking policy in general had to be given an entirely new lead.

Lead Banks. The lead bank system was introduced in 1969. It was based on the concept of what may be called 'area banking'. Each lead bank is allotted a district or districts in different places. The lead bank had the primary responsibility to study the conditions in the area allotted to it and prepare a development plan taking into account the existing credit set-up in the area and providing for filling up territorial or sectoral credit gaps. The plan had to coordinate the credit policies of all institutions in the area. The first lead banks chosen were the State Bank of India, its 7 subsidiaries, the 14 nationalised banks (1968) and 2 non-nationalised scheduled banks.

Branch Banking. The first obvious step in ruralising banking was to open branches in unbanked and poorly banked areas. Till 1968 commercial banks had confined their branches to urban or semi-urban centres only. But even here a very conservative policy was adopted. This is reflected in the fact that the maximum number of branches opened in any one year by the commercial banks came only to 677 and that in 1968 when 14 private banks were nationalised. From 1969 onwards a new dynamism appeared in branch banking. While in 1969, rural branches accounted

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Merchant Banking

Merchant Banking is an old term which signifies financing of goods in transit and providing financial advice. It is, in other words, what is today described as Consultancy Business. Consultancy functions include everything pertaining to a company from its very formation—preparation of prospectus, issue of shares, syndication of underwriting, negotiation of loans, permits, sanctions and other legal formalities and assistance in every field from choice of technology to the mark of products.

Merchant banking is fairly new in India. It started only in the seventies. The leaders in this matter were the State Bank of India and the public sector banks. Central financial institutions like ICICI, consultancy organisations like the Tatas, brokers' firms and financing agents have followed suit. The SBI is the largest merchant banker in India. It has already handled over 125 assignments, including management of over 105 public issues with an investment of Rs. 411,963 lakhs and syndication of loans from Rs. 20 lakhs to Rs. 100 crores, involving a capital outlay of Rs. 63,792.73 lakhs.

Considering the innumerable obstacles to the promotion of new enterprises—government regulations, Reserve Bank directives, foreign exchange complications, import and export hurdles—it is well that our banks and other institutions have come forward to help and advise new entrepreneurs. Otherwise, many of the new companies would have been still-born and many more would have died in their Infancy.

The merchant banking system, however, requires to be expanded and developed. At present, it is concentrated in Bombay. It has to spread to other cities and towns. Secondly, it has its own in-built constraints. These have to be looked into and removed. In any case, unless immediate steps are taken to rectify the shortcomings, the system may well remain for ever, what it is today—a mere drop in the vast ocean of the Indian economy.

for roughly 22 per cent of the total number of branches, in 1980, the rural branches increased to 46.6 per cent. Similarly, a greater number of branches were opened in unbanked or poorly banked States. Thus Assam, Bihar and Orissa, notoriously backward in banking, increased their branch strength by 530, 596 and 715 per cent respectively, compared to fairly well-banked States like Maharashtra (195 per cent), Gujarat (196 per cent) and Kerala (262 per cent).

In terms of absolute numbers, the total number of functioning bank offices increased from 8262 in July 1969 to 32,419 in July 1980. (Of these, more than half or 13,200 were opened in areas where no banking facilities existed). This works out at an average annual growth of about 2200 branches. With the increase in branches the average population served by a bank office fell from 65,000 (1969) to 17,000 (1980).

Priority Sectors. The small men comprise people in different walks of life—the small farmers, petty traders, small scale entrepreneurs, the artisans, manual workers and so on. These people were to be given precedence over the better-off classes in advances. The creation of such priority sectors has radically altered the credit structure of banks. The share of large and medium industries which stood around 61 per cent in March 1968 came down to 36 per cent in June 1980. Simultaneously, the share of agriculture and small industry rose from 9 per cent to 24 per cent. The number of bank accounts also increased from 2.7 lakhs (1969) to 75.5 lakhs (1979) in the agricultural sector and from 60,000 to nearly 22 lakhs (1969-79) in the small scale sector.

At the end of 1979-80, priority sector advances as a whole constituted 31.25 of the total bank credit, with agriculture accounting for Rs. 6727 crores, small scale sector Rs. 2630 crores and other groups like transport operators, retail traders, professionals and self-employed persons accounting for the balance—Rs. 1331 crores.

Differential Interest Rates. The scheme is meant primarily for the benefit of weaker sections to whom loans are provided for productive purposes at a concessional rate of interest of 4 per cent per annum.

Deposit Mobilisation. According to the available provisional data, aggregate deposits of scheduled commercial banks increased by Rs. 5593 crores during the current financial year (upto February 26, 1982), yielding a growth rate of 14.8 per cent compared to an increase of Rs. 5612 crores or 17.7 per cent during the corresponding period of 1980-81. Within the aggregate deposits, the demand deposits and time deposits showed an increase of Rs. 763 crores or 9.7 per cent and Rs. 4830 crores or 16.1 per cent, respectively.

Credit Expansion. The net aggregate advances (inclusive of participation certificates) of scheduled commercial banks increased by Rs. 4507 crores during the current financial year (upto February 26, 1982), yielding a growth rate of 17.8 per cent. This was considerably higher than the increase of Rs. 3480 crores or 16.2 per cent during the corresponding period of the financial year 1980-81.

Agricultural Advance. The advances by all Commercial Banks and Public Sector Banks to the agricultural sector in the year were as under:

Table 96

	December 1980	
	No. of Accounts (lakhs)	*Outstanding (Rs.crores)*
All Commercial Banks	96.39	3614
Public Sector Banks	92.61	3477

The total outstanding advances to agriculture sector by Public Sector Banks have shown a further increasing trend from Rs. 2583 crores covering 79.04 lakhs borrowal accounts at the end of December, 1979 to Rs. 3477 crores for 92.61 lakhs borrowal accounts as at the end of December, 1980. The share of agricultural advances in total outstanding bank credit of Public Sector Banks was 15.6 per cent in December, 1980 as against 14.3 percent in December, 1979.

Public sector banks continued their assistance to small/marginal farmers and agricultural labourers. As at the end of March, 1980, the loans of Public Sector Banks to farmers (direct finance excluding allied activities) with holding of land upto 5 acres, stood at Rs. 679.45 crores constituting 39 per cent of the direct agricultural advances.

113. AGRICULTURAL FINANCE

NABARD. The National Bank for Agriculture and Rural Development (NABARD) was formally inaugurated on Nov. 5, 1982 at New Delhi by Prime Minister Indira Gandhi. The Finance Minister, Pranab Mukherjee, who participated in the inaugural function pointed out that it was way back in 1976 that the National Commission on Agriculture suggested that all types of credit needs of the rural areas should be met through an integrated credit system leading to an Agricultural Bank at the apex. Although the matter was earnestly taken up by the government, it was only on July 12, 1982 that the government issued the Notification setting up the National Bank for Agriculture and Rural Development (NABARD)

"NABARD", the Finance Minister said, "is here to do what its name implies, ie, to promote agriculture and rural development. We are today engaged in a major effort at transforming and modernising the rural economy, through the introduction of new and improved techniques of production, which will raise productivity per man and per hectare. This change in technology requires a broadbased transformation in methods of cultivation. This transformation can only be achieved if adequate amounts of credit are made available to the rural producers. It must also be available on suitable terms. The availability of credit is all the more important for smaller farmers and the weaker sections of the rural community. Their access to resources is severely limited. Yet their potential productive capacity is very large. Upliftment of these sections of the community is central to our social and economic objectives".

The preliminary steps leading to the inauguration of NABARD were taken by the Committee appointed to review the Arrangements for Institutional Credit for Agriculture and Rural Development shortly known by the intricate acronym CRAFICARD. The Committee envisaged NABARD not only as the sole re-financing agency but also as the leader of the entire rural credit system of the country. As such, NABARD will not only replace the Agricultural Re-finance and Development Corporation, which is now a subsidiary of the Reserve Bank but also take over most of the functions of the Agricultural Credit Department and Rural Planning and Control Cell of the Reserve Bank. Thus NABARD will be responsible for the development, policy planning, training and consultancy and consequential matters relating to rural credit.

The paid up capital of NABARD will be Rs. 100 crores, to begin with. This will be contributed fifty–fifty by the Union Government and the Reserve Bank. The resources of the ARDC and the National Agricultural (Long Term Operation) Fund as well as the National Agricultural Credit (Stabilisation) Fund will be transferred to NABARD. Incidentally the last two organisations will be renamed National Rural Credit(LTO)Fund and National Rural Credit (Stabilisation) Fund, respectively. It shall be the responsibility of the Reserve Bank to make adequate funds available to NABARD subject, of course, to the overall credit and monetary exigencies of the national economy as a whole.†

NABARD is the logical culmination of a movement for a multi-agency approach to rural credit. The movement had originally stemmed from the poor performance of the Co-operatives and Land Banks. These were the first and only agencies for rural credit, the Co-operatives for short term and medium credit and the Land Banks for long term credit. The nationalisation of the leading private banks in 1969 brought a new and vigorous element into the rural economy. These banks were directed to open branches in unbanked or poorly banked areas and take up the dispensation of credit as a major task. The next entrant into the rural economy was the Regional Rural Bank, a new institution recommended by the Narasimhan Committee in 1975. These were brought into existence rather abruptly by Presidential Ordinance in Sept. 1975. The suddenness of their appearance was startling especially against the background of exasperating delays characteristic of the governmental machinery. But they came to stay and grow. The Regional Bank idea caught on rapidly and the first 5 banks established by the Ordinance increased to 107 in 1981.

Now all these agencies, Land Development Banks, Co-operative Service Societies, Regional Rural Banks and commercial banks which operate in rural areas will hereafter function under NABARD. For the first time, India will have one single organisation which will deal with all types of financial requirements of the farmers—short, medium and long term. It will also handle the financial requirements of the non-farming population in rural areas, especially the weaker sections in small industries, petty trades and crafts who have so far remained unattended.

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† **Report Economic Times.**

Regional Rural Banks. These were opened as a supplementary agency to co-operatives in dispensing rural credit. The Regional Rural Banks would 'combine the local feel and familiarity with rural problems, which the co-operatives possess and the business organisation, ability to mobilise deposits, access to centralised money markets and modernised outlook which the commercial banks have'. These institutions are expected to operate as a support to the old co-operatives and the newly opened commercial banks.

Each RRB may have an authorised capital of Rs. 1 crore and a paid up capital of Rs. 25 lakhs. The share capital will be contributed by the Central government, the State governments concerned and the respective sponsoring commercial bank in the following proportion—50:15:35. In Sept. 1975 the President issued an Ordinance setting up 5 Regional Rural Banks as part of a larger scheme of opening 50 Rural Banks all over India by April 1, 1977.

Growth of Regional Bank. On Oct. 2, 1975 the first 5 banks started business. Details relating to them are given below:

Table 97

First Five RRBs

Sl.No.	*Name of Bank*	*Districts covered*	*Sponsoring Bank*
1.	Parathama Bank, Moradabad, U.P.	Moradabad	Syndicate Bank
2.	Gorakhpur Kshetriya Gramin Bank, Gorakhpur, U.P.	Gorakhpur & Deoria	State Bank of India
3.	Haryana Kshetriya Gramin Bank, Bhiwani, Haryana	Bhiwani	Punjab National Bank
4.	Jaipur Nagaur Aanchalik Gramin Bank, Jaipur, Rajasthan	Jaipur & Nagaur	United Commercial Bank
5.	Gaur Gramin Bank, Malda, West Bengal	West Dinajpur Malda & Murshidabad	United Bank of India

According to the projections made for the Sixth Five-Year Plan (1980—85), 105 Regional Rural Banks are proposed to be set up bringing their total number to 170 covering 270 districts by the end of March, 1985.

Co-operative Movement. The co-operative movement began in India with the Co-operative Credit Societies Act, 1904. In 1912 this Act was amended to provide for non-credit societies, central financing societies and co-operative unions. Under the Government of India Act, 1919, co-operation became a provincial subject and the provinces were left free to make their own adaptations to the co-operative system. In 1979, when the co-operative movement celebrated its platinum jubilee, the co-operative system had expanded to cover 80 million members, of whom some 60 million were from agricultural families.

Co-operative Credit Societies. The primary objects of the Co-operative movement are to liberate the Indian villagers from the clutches of money lenders to promote the habit of thrift among the rural populace and to provide them credit for essential activities. These objects are inter-related and actually represent three aspects of the same problem.

Till 1975 co-operative societies were treated as the sole agency for discharging all these functions. But it was found that co-operative societies cannot take on by themselves the tremendous financial responsibilities involved. So "a composite programme for the betterment of the weaker sections in the rural areas" was evolved. The composite programme was threefold: (1) relief from indebtedness or the liquidation of outstanding debts, (2) regulation and control of the activities of the rural money lenders and (3) provision of credit to the rural folk for production as well as consumption.*

***Long term & Short term Loans.** There are two separate co-operative agencies for provision of agricultural credit—one for short and medium term credit and the other for long term credit. The former has a three-tier structure consisting of a State

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* For details relating to these points see Manorama Year Book 1982 edition.

(Apex) Co-op. Bank, District (Central) Co-ops. and Primary Agricultural Credit Co-ops. (PACs), also known as Service Societies, at the village level.

Long term credit for agriculture is provided by Land Development Banks. The Land Development Banks have a unitary structure in some states and a two-tier structure in others. The first type is made up of a Central Land Development Bank for a state with branches in various parts of the state. The second type has a cooperative Central Land Development Bank at the top under whose aegis primary Land Development Banks operate in different parts of the state.

Land Development Banks (LDBs) Growth. The present land development banks were originally conceived as Land Mortgage Banks and functioned as such. Even now many banks bear the name 'Land Mortgage Bank'. The original object of the Land Mortgage Bank was to help farmers to pay off their old debts by giving them long term advances on easy terms. Thus the primary mission of the land banks was the redemption of old debts. At the same time, loans were also given for development purposes like permanent improvements on land, provision of irrigation facilities etc. But the major portion of the advances was meant for the liquidation of debts.

The first Land Mortgage Bank was set up in 1929 in the then Madras province. The erstwhile princely state of Mysore opened a land bank in the same year. In 1935 the then Bombay province and the former princely state of Cochin started land banks. In 1938 Orissa set up a land bank. All these banks were central banks, operating over the entire province or state. Primary land banks as opposed to central banks were developed in Bengal and the old Central Province,now Madhya Pradesh. These banks operated over specified areas like a tehsil or district in the state.

In 1980, there were 19 state Cooperative Land Development Banks in the country, that is to say, in all States except Manipur, Meghalaya, Nagaland, and Sikkim, and one in Pondicherry. These SLDBs had 1749 branches or affiliated primary LDBs, operating at district/taluka/block levels.

On the whole, with nearly three lakh cooperatives and over 100 million members within their fold, the Indian Cooperative Movement has grown into a massive one. The movement is largely rural-based and the major thrust of activities is towards supporting agricultural production through provision of inputs for increased production and provision of post-harvest facilities to protect and promote the interests of farmers. The major emphasis in programmes of cooperative development is on helping the weaker sections and on developing backward areas.

Recent years have witnessed rapid strides in the diversification and expansion of the activities of cooperatives. The total agricultural credit provided by the cooperatives has increased from Rs. 214 crores in 1960-61 to over Rs. 2000 crores in 1980-81. During the same period, the value of agricultural produce marketed by cooperatives increased from Rs. 169 crores to Rs. 1950 crores. Through over 50,000 retail outlets, cooperatives distribute nearly 46 per cent of the total fertilisers in the country. They have emerged as a major sector in the sugar industry accounting for 56 per cent of the national production of sugar. Cooperatives also play a significant role in the dairy programme of 'Operation Flood'. The Indian Farmers Fertiliser Cooperative Ltd. accounts for 11 per cent of the indigenous nitrogenous fertiliser production and 23 per cent of phosphatic fertiliser production.*

Agricultural Advances. The total institutional credit for agriculture and allied purposes increased from Rs. 2420 crores as at the end of June 1979 to Rs. 2550 crores at the end of June 1980. Of this, the cooperatives advanced Rs. 1300 crores of short–term and Rs. 400 crores as term loans during the year ending 30th June, 1980 as against Rs. 1205 crores of short-term and Rs. 411 crores as term loans, respectively, during 1978-79. The targets for 1980-81 are Rs. 1500 crores of short-term loans and Rs. 485 crores of term loans by the cooperatives. While the cooperatives account for the major share of loans disbursed for agriculture and allied purposes, the commercial banks and Regional Rural Banks have also increased their direct lending from Rs. 771 crores during 1978-79 to Rs. 850 crores during 1979-80.

A discouraging feature of agricultural advances is the unsatisfactory recoveries. The percentage of recovery in respect of direct agricultural advances—both short-term and term loans—to demands in the last three years in the Public Sector Banks at the end of June each year is given below:

June, 1978	June, 1979	June, 1980
50.2	52.2	52.0

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* Ministry of Agriculture, 1981-82.

114. INDUSTRIAL FINANCE

Industry requires heavy long term loans. As commercial banks cannot take up this responsibility, institutions specially designed for the purpose had to be started. The Industrial Finance Corporation of India (IFCI) formed in 1948 was the first of such institutions. The IFCI was followed by State Financial Corporations (SFC's) in 1951, the Industrial Credit & Investment Corporation of India (ICICI) in 1955 and the Industrial Development Bank of India in 1964. The Industrial Reconstruction Corporation of India (IRCI) set up in 1971 for West Bengal has since been functioning as an all-India organisation. Other institutions participating in industrial assistance are the Life Insurance Corporation of India (1956), the Unit Trust of India (1964) and the Deposit Insurance and Credit Guarantee Corporation of India (DICGI).

The State Financial Corporations (SFC's) and other organisations like State Industrial Development Corporations and State Investment Corporations are confined to the particular States concerned.

IFCI. The IFCI was established in 1948—the very first year after independence. Its main object was to provide medium and long term credit to industry especially when accommodation from normal financial sources was inappropriate or recourse to the capital market was impractical. The IFC's finance goes largely to the public limited companies in the private sector and co-operative societies.

Small scale industries have an important place in the Indian economy for economic, social and even political reasons. These industries were also expected to grow rapidly and arrangements had, therefore, to be made for meeting their growing financial needs. It was for this purpose that the State Financial Corporations were established in 1952. Almost each state has a corporation of its own which meets the requirements of medium and small-sized industrial units in the state. **The National Small Industries Corporation** was established in 1955 to aid, counsel, assist, finance, protect and promote the interests of the small industries in the country.

ICICI. As industries began to progress, there arose the need for foreign resources —capital as well as knowhow. The ICICI was established in 1955 (with the support of the World Bank) with the important object of providing foreign currency loans to Indian industries in the private sector. It also provides rupee loans and extends other assistance to industry.

The Industrial Reconstruction Corporation of India (IRCI) was first set up to look after the ailing industries of West Bengal. Subsequently its jurisdiction was extended to cover sick units all over India.

The Life Insurance Corporation of India (LIC) came on the scene first to underwrite or participate in the floatation of new companies but later extended its activity to cover outright loans. With its huge resources LIC has emerged as the biggest institutional lender and has covered a vast range of undertakings—State Electricity Boards, State Housing Schemes, Water Supply Projects, Municipal Committees, Zilla Parishads, Industrial Estates, Transport Corporations and Industrial Co-operatives and similiar concerns.

UTI. The UTI established in 1964 has also invested sizeable resources in industrial securities and provided long term finance to industry. It is important that UTI collects the small savings of a large number of persons so as to promote the investment habit among those who would not have otherwise been able to diversify the investment risk. Investors in units have not only tax reliefs but also an assurance of good income and, sometimes, capital appreciation.

IDBI. The Industrial Development Bank of India is the apex organisation for industrial finance. It was formed in 1964. It took over the Industrial Refinance Corporation which was set up in 1956 to provide refinance facilities to commercial banks. The IDBI coordinates the activities of all other term lending institutions and provide them re-finance facilities.

The overall activities of IDBI are direct assistance to industrial concerns, refinancing of industrial loans granted by banks and other financial institutions, rediscounting assistance, finance for exports and assistance to financial institutions by way of subscribing to their shares and bonds and promotional activities for bringing about viable industrial development especially in the less developed areas.

IDBI also plays an important role in undertaking export guarantees which constitute a major support for achieving contracts abroad.

IDBI has been further vested with the responsibility of strengthening the resources of SFC's and other financial institutions like IFCI, ICICI and IRCI. The purpose is to enable them to diversify and expand their activities.

Deposit Insurance & Credit Guarantee Corporation of India (DICGC). In 1978 the Credit Guarantee Corporation of India was taken over by the Deposit Insurance Corporation under the Deposit Insurance Corporation (Amendment and Miscellaneous Provisions) Act of 1978.

With the merger, the name of the Corporation was changed into the Deposit Insurance and Credit Guarantee Corporation of India (DICGC). The DICGC has a capital of Rs. 10 crores contributed by the RBI. The RBI also exercises overall control of the activities of the new Corporation. The Corporation is empowered to guarantee credit facilities given by any credit institution and also to indemnify credit institutions in respect of credit facilities granted by them.

The Credit Guarantee Scheme for small scale industries was introduced in July, 1980 and is being administered by the Reserve Bank of India on behalf of the Government. The guarantee cover with effect from 1-2-1970 is extended on an automatic basis in respect of eligible credit facilities granted to small scale industries and small scale ancillary industries.

S. F. Cs. The aggregate loan assistance sanctioned by the 18 SFCs and Tamil Nadu Industrial Investment Corporation during 1980-81 (April-March) stood at Rs. 368.46 crores as against Rs. 254.97 crores during the previous year. The amount disbursed during the year stood at Rs. 247.71 crores as against Rs. 185.50 crores during the previous year. The assistance sanctioned to small scale units during the year totalled Rs. 268.76 crores as against Rs. 185.07 crores during the previous year and formed 73 per cent of the total assistance sanctioned by SFCs. The assistance sanctioned to units in backward area stood at Rs. 197.17 crores during this year as against Rs. 149.21 crores during the previous year. Sanctions to technical entrepreneurs during the year totalled Rs. 15.74 crores as against Rs. 13.93 crores during the previous year.

IRCI. As at the end of June 1981, the total cumulative disbursement amounted to Rs. 82.5 crores to 96 industrial units as against Rs. 68.29 crores to 92 industrial units in June 1980.

DICGC. The aggregate scheme of guaranteed advances came to Rs. 3305.98 crores in June 1981, which represents a rise of 18.1 per cent over 1980. Advances to farmers constitute 64.6 per cent, followed by transport operators (13.3 per cent), retail traders (11.2 per cent), professionals and self-employed persons (4.5 per cent) and business enterprises (4.1 per cent).

LIC. Total loans advanced to various institutions as on March 31, 1981 stood at Rs. 2718.56 crores of which Rs. 2071.49 crores were outstanding on that date.

UTI. Direct financial assistance sanctioned to companies through underwriting and subscription to public issues/ privately placed debentures declined to Rs. 57.92 crores from Rs. 64.32 crores. Disbursements of assistance at Rs. 46.82 crores were also lower than those of the previous year at Rs. 73.62 crores.

Term Lending Institutions. Disbursements by three all-India term lending institutions, Industrial Development Bank of India (IDBI), Industrial Finance Corporation of India (IFCI) and Industrial Credit & Investment Corporation of India (ICICI), during the year 1980-81 were higher as compared to the preceding years. It is expected that disbursements by these institutions during the financial year 1981-82 would further increase to Rs. 1739.20 crores, as against the total disbursement of 1397.28 crores during 1980-81.

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SDFC*

For a capital intensive industry like shipping, external sources of funds are unavoidable. But liberal financial assistance with inadequate capital base is usually fraught with dangers. The SDFC, it is reported, has been called upon to honour their guarantees by coming to the 'rescue' of the companies trapped by the market forces. Though they were charged penal interest(8 per cent) on the loans paid-up by the SDFC, it was considered cheaper in international comparsion.

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* Shipping Development Fund Committee.

115. INLAND TRADE

The inland trade of India is gigantic compared to which its foreign trade is small. However, no statistics about the total volume of inland trade are available. In 1947, the Planning Commission estimated that India's inland trade was about Rs.7000 crores whereas its foreign trade amounted to about Rs. 350 crores. If this proportion is any guide, the total value of India's internal trade today must be fantastic, considering the expansion of its external trade.

A vast internal market is an advantage and a liability. The advantage is that there is a big home market to support large scale production, without fear of foreign competition. The liability is that domestic producers have to cater to the varied demands of a huge population. The advantage has been fully exploited, the liability has never been properly discharged. Once the home market was protected, the entire country lay at the mercy of the domestic producers.

Domestic production (agricultural and industrial) failed the home market both in quantity and quality. Agricultural production depended on the weather and its ups and downs are unpredictable. But industry cannot claim any such alibi. Nevertheless, shortfalls in industrial production plagued the economy from time to time. Simultaneously quality suffered too. Shoddy goods filled the market.

Razor blades are a case in point. The import of blades was stopped in the fifties. Indian producers promptly came on the scene. They filled the country with blades which were no better than hacksaws but were priced at the standard rates. The blades improved slightly in course of time but still continued to give poor service. In May 1981, the government announced that new licenses for the manufacture of blades were being issued, even though the approved capacity was far in excess of the demand. It is the persistent poor quality of the blades that prompted the government to take this unusual step. What is true of blades is true of almost every consumer article produced in India. The total result was that the common man found it difficult to obtain essential goods at reasonable prices. This is what led to the Essential Commodities Act, 1955 and to the formation of the Ministry of Civil Supplies in 1980.

Essential Commodities are goods declared as essential under the Essential Commodities Act, 1955. Under this Act the Government has powers to declare any commodity as essential, at any time. The list of essential commodities notified under the Act can be increased, reduced or altered from time to time according to the discretion of the Government. In 1980, 65 commodities stood listed as essential commodities under the Act.

Civil Supplies comprise articles of mass consumption, particularly the following: Foodgrains, Vegetable oils, Sugar, Baby foods, Drugs, Soap, Textiles, Matches, Kerosene and Diesel oil, Paper and Stationery, Cycle tyres and tubes, Soda ash Dry cells for torches, Electric lamps, Hurricane lanterns, Milk, Foot-wear, Razor blades, Household utensils and Bicycles.

Regulated Market. Civil Supplies or Essential Commodities constitute a sphere of trade, which is strictly controlled and regulated by law. Nevertheless, these goods are produced and marketed through normal trade channels and figure as part of India's inland trade.

Goods falling within the Regulated Market are not always the poor man's necessities (baby foods, for example), nor are all of them essential (electric torches, for instance). These goods have by and large been selected for their persistent tendency to go under the counter.

Amendment. Experience had shown during the last few years that some of the existing provisions of the Essential Commodities Act, 1955 had not been adequate and effective in quick disposal of cases on the one hand and sufficiently deterrent to the offenders on the other so as to have the desired impact on inflationary trends in prices and easy availability of commodities to the consumers. To overcome these inadequacies, the Essential Commodities Act was amended through legislation enacted in the 1981 Monsoon Session of the Parliament.

The amendment among other things provides for a summary trial of all offences under the Act, for a minimum mandatory imprisonment for a period not less than 3 months, making all offences under the Act non-bailable and barring appeals to a judicial authority.

Public Distribution System. A public distribution system was found necessary because the free market system has been found wanting in protecting the interests of the low income consumers. The public agencies of the Central and State Governments are required to arrange for procurement, stocking and distribution of various essential commodities, through the approved outlets, to meet the requirements of the common man.

Public distribution system is an integral part of the Sixth Plan and is being developed as such. The co-operatives are being organised to form the bulwark of the public distribution system. The co-operative distribution system of consumer articles comprises consumer cooperatives in urban areas and agricultural service and marketing cooperatives in rural areas. The consumer cooperative structure is a four-tier system comprising the National federation, State federations, central society at the district and primary society at the base levels.

With a view to ensuring the distribution of essential commodities at reasonable prices to the consumers both in the rural and urban areas efforts were made during the year to expand the Public Distribution System which forms the backbone of the supply management of essential commodities. As against 2.40 lakh Fair Price Shops in March, 1980 there were 2.97 lakh such retail outlets at the end of 1981. There was a significant increase in the quantity of foodgrains distributed through fair price shops.

Sustained efforts were made to strengthen the consumer cooperative network in the country in order to support the Public Distribution System. The Consumer Co-operatives in urban areas were oriented towards increasing coverage of weaker sections and achieving higher efficiency for greater consumer satisfaction by making available quality goods at reasonable prices. In the rural areas, more and more agricultural credit societies/temporary marketing societies were involved in the Public Distribution System to meet the consumer requirements in the villages. The main thrust continued to be towards the establishment of small retail outlets to serve the weaker sections and consolidate the existing structure of consumer cooperatives by making them financially strong and efficient in business operations so as to have a sobering effect on the price structure. The value of consumer articles distributed by Consumer Co-operatives increased from Rs. 800 crores in 1979-80 to Rs. 920 crores in 1980-81 and is expected to go up to Rs. 1000 crores in 1981-82 in rural areas.

Wholesale Prices. The all-commodities wholesale price index moved up by only 2.7 per cent during the period April—December, 1981 as against an increase of 10.2 per cent in 1980 and 20 per cent in 1979 during the same period of nine months. The average monthly increase worked out to 0.3 per cent during the year as against 1.1 per cent in 1980 and 2.2 per cent in 1979.

A notable feature of the overall price situation has been a declining trend in the general index during four consecutive months ending December, 1981. During this period, the general index moved down by 4.0 per cent. The monthly movement of all-commodities wholesale price index during April-December in 1980 and 1981 is indicated in the following table.

Table 98

All-Commodities Wholesale Price Index Numbers

(Base : 1970-71=100)

Month	*Year* 1980	1981	*Percentage change over the year*
April	235.0 (+0.8)	275.7 (+2.1)	+17.3
May	240.0 (+2.1)	277.9 (+0.8)	+15.8
June	247.2 (+3.0)	279.8 (+0.7)	+13.2
July	257.8 (+4.3)	286.2 (+2.3)	+11.0
August	260.3 (+1.0)	288.8 (+0.9)	+10.9
September	263.8 (+1.3)	284.6 (−1.5)	+ 7.9
October	264.6 (+0.3)	283.8 (−0.3)*	+ 7.3
November	258.6 (−2.3)	279.8* (−1.4)	+ 8.2
December	257.1 (−0.6)	277.3* (−0.9)	+ 7.9

* Provisional

Note: Figures in brackets denote percentage variation over the preceding month.

The rate of inflation, as measured in terms of all-commodities wholesale price index and on the basis of a point-to-point comparison, has shown considerable downtrend. In the first month of 1981—82, the rate of inflation was 17.3 per cent.

Since then it has been almost continuously coming down reaching 7.9 per cent in December, 1981.

The main thrust of Government policy has been to increase the production of essential commodities particularly those which were in short supply. The support prices of various agricultural commodities were raised during the year to give remunerative price to the producers and to maintain the tempo of increased production. This resulted in remarkable improvement in the production of agricultural commodities in-as-much as the production of foodgrains increased from 110 million tonnes in 1979-80 to 130 million tonnes in 1980-81 registering an increase of over 18 per cent. Besides, the production of most of the mass consumption manufactured products in the organised industrial sector was also higher during the first eight months of 1981-82 as compared to the same period in 1980-81.

With the increase in production and better supply management, the availability position of essential commodities and items of mass consumption was generally satisfactory. There was considerable improvement in the availability of sugar, khandsari and gur. The supply position of cereals and edible oils was also fairly satisfactory. However, shortages were felt in respect of cement, kerosene and soft-coke in certain parts of the country.

116. FOREIGN TRADE

Trends in Foreign Trade. For some years the foreign trade of India has had to contend with severe strains unleashed by growing imbalances. While domestic and external constraints like drought, shortage of power, and basic inputs, global recession and the growth of protectionist tendencies abroad were severely impeding the growth of exports, there was a phenomenal rise in the import bill due to a steep rise in the prices of petroleum, fertilisers etc. All told, India's foreign trade deficit which amounted to Rs. 1088 cr. in 1978-79 rose sharply to exceed Rs. 5000 cr. in 1980-81.

According to the available data, India's overall exports and imports during the year 1980-81 amounted to Rs. 6710.64 crores and Rs. 12500.94 crores respectively with a consequential trade deficit of the order of Rs. 5790.30 crores. The mounting trade deficit over the last two years was due partly to slow growth in exports and mainly to a phenomenal rise in import bill in the wake of steep increases in the world prices of essential imports particularly POL. The C.I.F. unit value of petroleum and petroleum products rose by almost two and a half times between 1978-79 and 1980-81 with a further upward trend in the first half of 1981-82.

During 1980-81 the growth of exports was about 4 per cent whereas imports grew by as much as 39 per cent. The shortfall in the achievement of export target of Rs. 7100 crores in 1980-81 is attributable to the lagged effect of the poor performance of the Indian economy in 1979-80 when there was a sharp deterioration in almost every sector including agricultural and industrial production, overall national income, price situation and infrastructural requirements of economy. The resultant domestic shortages also necessitated higher imports of essential commodities which inflated the import bill.

The trends in India's external trade, however, tended to be better during 1981-82, despite continuance of adverse trading environment abroad. According to the provisional data, India's overall exports in the first nine months of the current year i.e. April—December, 1981 amounted to Rs. 5317.04 crores as against the provisional figure of Rs. 4613.47 crores in the corresponding period of the previous year. This reflects an increase of about 15.2 per cent. Imports, on the other hand, at a provisional total of Rs. 9426.15 crores during this period showed an increase of 11.9 per cent over the provisional figure of Rs. 8420.23 crores in the same period of the last year. The deficit of foreign trade for April—December, 1981 was Rs. 4109.11 crores as compared to the provisional deficit figure of Rs. 3806.76 crores for the corresponding period of the previous year. On the whole, the current year has witnessed a tendency for not only higher rate of increase in exports but also a deceleration in the growth of imports.

The trend of India's overall exports, imports and balance of trade for the last few years is indicated below:

Table 99
Balance of Trade

(Rs. crores)

Year	*Exports*	*Imports*	*Balance of Trade*
1976-77	5142.25	5073.79	+68.46
1977-78	5404.26	6025.29	−621.03
1978-79	5726.26	6814.30	−1088.04
1979-80	6458.77	9021.75	−2562.98
1980-81*	6710.64	12500.94	−5790.30
April-Dec. 1981 (Prov.)	5317.04	9426.15	−4109.11
April-Dec. 1980 (Prov.)	4613.47	8420.23	−3806.76
April-Dec. 1980 Revised	5014.55	8969.14	−3954.59

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* Updated—upto December, 1981.

Balance of Payments. So long as our exports do not pay for our imports we have to fall back upon invisible receipts from abroad, to even out our foreign accounts. But while trade deficits increase every year, invisible receipts—mainly remittances from Indians abroad—" appears to have reached a plateau and may not contribute significantly" to strengthening our international finances.

The Economic Survey (1981-82) puts the net invisible receipts at around Rs. 2000 crores in 1980-81, which is more or less the same as in the previous year. In other words, the current account deficit during 1980-81 may be much higher than in the previous year.

The adverse movements in the balance of trade were only partly cushioned by rising net invisible receipts. The surplus on invisibles account in 1978-79 was Rs. 1692 crores. With a trade deficit of Rs. 1843 crores, this yielded a current account deficit of Rs. 151 crores. Complete data on net invisible receipts are not available for later years but partial data indicate that although these receipts have remained buoyant they have not been sufficient to offset the deterioration in the trade balance. The deficit on current account rose further in 1979-80 and in 1980-81 it widened very considerably to over Rs. 2700 crores. This was financed by net aid flows of about Rs. 1058 crores, drawings aggregating Rs. 815 crores under the IMF Trust Fund and Compensatory Financing Facility and a drawdown of Rs. 342 crores in foreign currency assets.

Export-Import Bank of India (Ex. Im. Bank). The Export-Import Bank of India has been set up with effect from 1st January, 1982 to provide financial assistance to exports and imports and to function as the principal financial institution for coordinating the functions of institutions engaged in financing of exports and imports of goods and services. This bank, apart from providing direct finance to exports and imports, will also refinance commercial banks. It is also expected to take over shortly the export financing functions of the Industrial Development Bank of India. Government have subscribed a sum of Rs. 50 crores as paid up capital of the bank. While the Chairman & Managing Director of the bank has been appointed, the appointment of other directors will be notified shortly.

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Latest Position

The trade deficit in 1981-82, for which up-dated figures are now available, has belied all official expectations. According to the revised data, the deficit is placed at Rs. 5886 crores —a record level. The provisional figures released by the Commerce Ministry earlier had estimated the deficit at Rs. 5714 crores.

Instead of showing a fall compared with the 1980-81 figure, as was expected all along, the trade deficit turned to be higher at Rs. 5886 crores against Rs. 5814 crores in the previous year (1980-81).

The up-dated figures estimate the export earnings for 1981-82 at Rs. 7560.35 crores while the import bill for that year is placed at Rs. 13446.73 crores.

These statistics are still considered provisional. But they will now undergo only slight changes as most of the data have already been received for 1981-82.

Compared with the figures for 1981-82, export earnings in 1980-81 were of the order of Rs. 6710 crores and the value of imports was Rs. 12,524 crores, showing a trade deficit of Rs. 5814 crores.

News Report, New Delhi, Sept. 4.

117. POWER

Conventional Sources of Energy. The sources of energy in India have been classified under 4 heads. (l) Energy contributed by humans and animals (living energy), (2) by animal and vegetable wastes like cowdung fuel (non commercial energy), (3) by coal, oil and electricity (commercial energy) and (4) atomic energy. Atomic energy is a class by itself. The energy contributed by the first three sources has been converted into equivalents of coal and works out as under in India.

Table 100

		Million tonnes (coal equivalent)	*Per cent*
(i)	Living Energy	124.6	39.1
(ii)	Non-commercial energy	100.0	31.4
(iii)	Commercial energy:		
1.	Thermal Power based on coal or oil	9.3	2.9
2.	Hydro Power	12.0	3.8
3.	Oil (used as such)	18.5	5.8
4.	Coal (used as such)	54.0	17.0
	Sub-total (group iii)	93.8	29.5
	Total	318.4	100

Non-conventional Sources. In view of the high increase in oil prices, non-conventional power sources like solar energy, tides, winds and geo-thermal energy are being investigated by countries which are not petroleum exporters. India has taken up investigation of tidal energy and geo-thermal energy (energy from the internal heat of the earth).

Distribution of Power Resources. Among the commercial sources of power India was considered poor in oil but rich in coal and water power. Recent progress in oil prospecting has changed this picture. It is now known that India has enough oil potential. It can become self-sufficient in oil in the immediate future if the present tempo of investigation is kept up.

These resources, namely, oil, coal and water power are, however, unevenly distributed in the country. While Kerala, Karnataka, J and K, Assam, H. Pradesh and Arunachal Pradesh have abundant hydro-electric power but little or no reserves of coal, W. Bengal and Bihar have large reserves of coal, but very little hydro-power. On the other hand, states such as AP, MP, Maharashtra, UP and Orissa have both hydro-power and coal resources. Considering this uneven distribution, it was suggested by the National Development Council, that all future power generation should be arranged on a regional basis, and not on a state basis.

About 95 per cent of the total installed capacity is accountable to hydro-power and coal-based thermal power stations. It was only in 1969 that a nuclear power station was commissioned. There are at present two nuclear power stations in operation in the country, one in Maharashtra (Tarapur) and the other in Rajasthan (Kotah). Their relative contribution is still small.

Central Electricity Authority. The administration of Electric power (generation, transmission and distribution) is governed by two legislative enactments, the Indian Electricity Act 1910 and the Electricity (Supply) Act 1948.

The Central Electricity Authority, established in 1950, is responsible for evolving a long term power policy, co-ordinating the activities of the Regional and State Electricity Boards and supervising the execution of all power projects in the country.

Regional Electricity Boards. Regional Electricity Boards were set up in 1964 in each of the five regions to bring about voluntary co-operation between the states for developing regional grids and promoting coordinated operations of power systems. The five Regional Electricity Boards are: Northern Regional Electricity Board covering Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Uttar Pradesh, Chandigarh and Delhi; Western Regional Electricity Board covering Gujarat, Madhya Pradesh, Maharashtra, Goa, Daman & Diu and Dadra and Nagar Haveli; Southern Regional Electricity Board covering Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Pondicherry; Eastern Regional Electricity Board covering Bihar, Orissa, West Bengal, Sikkim and Damodar Valley Corporation System; and North-Eastern Regional Electricity Board covering Assam, Manipur, Meghalaya, Nagaland, Tripura, Arunachal Pradesh and Mizoram.

State Electricity Boards. State Electricity Boards have been established in 18 out of the 22 states and they are mainly responsible for generation and distribution of electricity in their respective states. States in which Electricity Boards are yet to be established are Manipur, Tripura, Nagaland and Sikkim. In these states, the State Governments have the responsibility for power development.

All-India Grid. The pattern of power development in India is as follows. The States of Karnataka, Kerala, Punjab, Orissa and J and K develop mainly hydropower; Bihar, West Bengal, Gujarat and Rajasthan mainly thermal power; Maharashtra, Tamil Nadu, AP, UP, Assam and MP are partly thermal and partly hydro. The ultimate form of power supply will be an All-India Grid of interconnected hydro electric and thermal power stations in all the regions.

The all-India grid will be under the Super Grid Directorate in the Central Electricity Authority, which will co-ordinate the activities of the Regional Boards.

Total Installed Capacity. The total installed capacity of power generation in the country at the beginning of 1980-81 was 28,448 MW. It is proposed to add a new generation capacity of 19,666 MW during the Sixth Five-Year Plan. During 1980-81 a new capacity of only 1823 MW was commissioned.

Power Supply Position. With the expected generation of 122,000 MU during the year 1981-82, the energy shortage in the country is expected to come down to 10.9 per cent during 1981-82 from 12.7 per cent during 1980-81 and 16.1 per cent during 1979-80. The details of energy requirement and availability during the period 1980-81 and 1981-82 are as given below:

	1980-81	*1981-82*
Requirement	127325	137000
Availability	111106	122000
Deficit	16219	15000
%age shortage (anticipated)	12.7	10.9

Hydro Resources. Hydro power constitutes the most economic source of power development in the country. Its intrinsic economic value has been further enhanced as a result of recent increase in the price of oil and coal. Hydro-electric power stations contribute about 40 per cent to the total present production of electrical energy in the country.

On a rough calculation on the basis of data compiled, the total hydro potential in the country has been tentatively assessed to be over 45 million kW at 100% load factor, corresponding to over 75 million kW at 60% load factor and nearly 150 million kW at 30% load factor.

The power generation from hydro electric plants varies from year to year depending on the availability of water. The hydro projects are usually designed on the basis of water availability for 90 per cent of the time.

Presently, 70 hydro-electric schemes with a total installed capacity of 10169 5 MW are under different stages of construction. It is proposed to increase the proportion of hydro power in the installed capacity by giving more priority to hydro projects both in the State Sector as well as in the Central Sector.

Thermal Stations. Coal is the largest naturally occurring source of commercial energy in india and is one of the principal sources of power production. At present, coal-based thermal plants contribute about 56.6 per cent of the total power generation.

Most of the thermal stations are coal-based. There are seven thermal stations which use oil. Gas is used only by two stations. The capacity of a thermal plant is determined by a number of factors, such as the need for annual maintenance of boilers, uniformity in load conditions, forced outages, etc. Thermal stations, in an interconnected system may be expected on an average to generate 4500 G.W.A. per kw.

Nuclear Energy. Nuclear power generation was initiated in India in 1969 with the commissioning of the Tarapur Atomic Power Station with an installed capacity of 420 MW. The following nuclear power stations are presently under construction:–

Rajasthan Atomic Power Station (near Kota) (RAPS)	2×220 MW
Madras Atomic Power Station (near Kalpakam) (MAPS)	2×235 MW
Narora Atomic Power Station (UP) (NAPS)	2×235 MW

Of these, the first unit of 220 MW RAPS was commissioned in December, 1973. The second unit RAPS was commissioned in 1980.

Rural Electrification. Rural electrification involves supply of electric energy mainly to two types of programmes:

(a) Production-oriented programmes like minor irrigation, rural industries etc., and (b) village electrification. At the time India attained independence in 1947, only about 1500 villages and about 6430 pumpsets were provided with electricity. With the beginning of the Five-Year Plans in India, more emphasis was laid on Rural Electrification and considerable investment was made in this respect. As a result of this, the number of villages electrified and pumpsets energised have increased steadily over the years. The table given below will show how these figures increased during the various Plan periods:

Table 101
Rural Electrification

	Rural Electrification	
	Villages Electrified	*Pumpsets Energised*
March—1951	3,061	21,008
March—1961	21,754	198,904
March—1971	106,774	1,571,000
March—1974	156,729	2,426,133
March—1980	250,112	3,949,120
March—1981	272,625	4,330,437
March—1985†	350,000	6,500,000

† This can be a projection only.

Table 102
Generation Mix

Year	*Hydro Capacity (MW)‡*	%	*Thermal Capacity (MW)‡*	%	*Nuclear Capacity (MW)‡*	%
1960-61	1917	34	3737	66	—	—
1970-71	6383	39	9468	58	420	3
1973-74	6965	38	10851	59	640	3
1978-79	10836	37	17822	61	640	2
1979-80	11387	36	19280	62	640	2
1980-81*	11794	36	20487	62	860	2
Projections						
1984-85	16154	31.6	33708	65.8	1330	2.6
1989-90	30000	37	50000	61	1800	2

Table 103
Growth of Power Industry

Year	*Installed‡ Capacity (MW)*	*Energy Generation (GWH)*	*Per capita Consumption (KWH)*
1950	2302	7514	18
1960-61	5654	20123	38
1970-71	16271	61212	90
1973-74	18456	72796	98
1979-80*	31307	112820	131
1980-81	33141	119226	135
Projections			
1984-85	51192	191000	212
1989-90	82000	310000	320

Table 104
Electricity Consumption

(Utilities only)

	Share %				
Sector	*1950-51*	*1960-61*	*1970-71*	*1979-80**	*1980-81**
Domestic	12.6	10.8	8.8	10.8	11.3
Commercial	7.5	6.1	5.9	6.0	6.0
Industry	62.6	69.3	67.6	58.9	58.6
Agriculture	3.9	6.0	10.2	17.2	17.5
Other	13.4	7.8	7.5	7.1	6.6

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* Provisional

‡ Includes figures of Non-Utilities also.

ADDITIONAL SOURCES OF ENERGY

In his Budget (82-83) speech the Finance Minister said, "The government attaches importance to renewable energy sources. The Commission for Additional Sources of Energy had initiated several important R & D demonstration projects, in the areas of solar, thermal, photovoltaic, wind, bio-mass and integrated energy systems. The government has exempted the manufacture of solar energy devices from industrial licensing".

The Commission for Additional Sources of Energy has been set up under the Chairmanship of the Secretary, Department of Science and Technology for, inter alia, formulating policies and programmes for development of new and renewable sources of energy and co-ordinating and intensifying development activities in this area.

Bio-Gas. India with its large cattle population and agricultural base has a sizeable bio-gas potential which can be harnessed to meet the energy need, specifically of rural areas. The technology of bio-gas and associated manure production has been developed indigenously.

The Khadi and Village Industries Commission (KVIC) has taken up the responsibility of popularising Bio-Gas in rural areas (See Box).

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Progress of Bio-gas Scheme

Prohibitive cost, complicated design and centralisation have made India's biogas programme a virtual non-starter.

The gobar gas programme was launched in India in 1961. It was publicised and propagated by the Khadi and Village Industries Commission.

Among the nations of the Third World, India and China are the only ones which have embarked on this method of providing energy in rural areas. China uses pig waste.

Conventional Indian plants known as the KVIC design with an underground masonry digester and a mild steel floating gas holder are easy to operate for producing the gas at uniform pressure.

China, as compared to India, started the biogas programme nine years later in 1970. A comparison of figures is revealing. In 1973, India had 8000 biogas plants in operation compared to 5000 in China. By 1979, while India had 80,000 units, China had reached 7.2 million units.

Looking at India's programme run mainly by the KVIC, several drawbacks have slowed down the programme. Most biogas plants are designed to run only on cattle dung, and a minimum of five to six animals are needed to run a family-size plant.

The cost of the plant ranges from Rs. 5000 to Rs. 7000. The KVIC gives 15 per cent of the cost as subsidy, 10 per cent is contributed by the farmer as seed money, and the balance comes as loan from banks.

An average farmer has to invest about Rs. 1000, including accessories. In some states such as Bihar, the government gives a subsidy equal to that of the KVIC, almost covering 50 per cent of the total cost.

The farmer is dependent on outside agencies for most of the things. Not many Indian farmers can afford Rs. 1000 for the plant. In China, a similar family-sized plant costs about Rs. 150, which is one-fifth of the monthly income of an average farmer.

There are about 100,000 gas plants in the country, 95 per cent of which are of the KVIC design, and less than 5 per cent are Chinese models. These are mostly in UP and a few in Karnataka. Chinese plants, it is held, have gas leakage problems, since it is difficult to make a masonry structure leak-proof. However, the Chinese have reportedly overcome the problems of leakage.

"Here is a technology where there are no losers. Yet, the revolution has not come about", says Professor Amulya Kumar Reddy, Chairman of the Karnataka State Council of Science and Technology and an expert in rural technology.

Express News Service, Nov. 9, 1982.

Solar energy. India receives substantial quantities of solar radiation and the number of sunny days in the year are high. The maximum, minimum and average solar radiation in some representative locations of India is indicated below:—

Table 105
Solar Radiation
(in cals/pér sq. cm/day)

Station	*Maximum*	*Minimum*	*Average*
Madras	765	606	720
Bangalore	746	562	668
Bombay	795	542	701
Calcutta	817	501	681
Delhi	827	421	655
Srinagar	738	239	631

The minimum radiation occurs in December and for most locations it is about 500 cal/per sq cm/day. The intensity and distribution of solar energy are favourable for its use in India. The Government attached considerable importance to harnessing non-conventional and renewable sources of energy. Solar energy and bio-gas offer the greatest scope under conditions obtaining in our country and very high priority has been accorded for their development.

An integrated research programme involving several agencies has been undertaken by the department of Science and Technology.

High priority has been accorded to development of solar pumps. A co-ordinated project has also been undertaken to develop cheap solar cells for conversion of solar energy into electricity directly.

Geo-thermal Energy. The activities in the geo-thermal field in the country are directed towards locating promising hydro-thermal reservoirs for power generation and other possible uses of the heat energy. Based on the preliminary geological and geo-chemical studies, two experimental projects, viz., one at Parbati Valley in Himachal Pradesh with the assistance of UNDP and the other called "Puga Geothermal Assessment Project" in the Puga Valley in J & K have been undertaken to make a detailed assessment of geo-thermal potential.

Tidal Power. Investigations on the possibility of use of tidal power were carried out by various agencies in the past. The possible areas where the tidal range is fairly high and where tidal power could be developed are in the Gulfs of Kutch and Cambay along the West Coast and in the Sunderbans areas in West Bengal along the East Coast. It does not seem likely that tidal power could be important in meeting India's energy needs for quite some time.

Wind Power. The possibilities of using wind energy in India has been investigated and it has been found that by and large the wind velocities are low and winds are not steady enough to permit any significant use of this source of energy.

118. COAL and LIGNITE*

Coal, including lignite, comprises the largest single source of energy in India. It is estimated to contribute nearly two-thirds of India's total supply of commercial energy (see *Power*, supra).

Coal Reserves. The coal reserves of India as per the latest assessment (September, 1978) made by the Geological Survey of India stand at 86,428 m.t. for coal seams of 1.2 m. and above in thickness down to a depth of 600 m. If, however, the seams of thickness 0.5 m. and above and down to a depth of 1200 m. are considered, the reserves go upto 111,878 m.t. The total reserves of lignite stand at about 2100 m.t. The following table summarises the reserves of coking coal and non-coking coal in seams 1.2 m. and above upto 600 m. depth.

Table 106
Coal Reserves (in m.t.)

	Total Gross Reserves	*Proved Reserves*	*Indicated Reserves*	*Inferred Reserves*
Coking Coal				
Prime Coking	4966	4505	462	—
Medium Coking	10111	3894	4991	1226
Semi to weakly Coking	3673	1198	1810	665
Total Coking Coal	18750	9597	7263	1891
Total Non-Coking Coal	66826	15096	29498	22233
Total for the Gondwana Coal	85578	24693	36761	24124
Tertiary Coal	850	82	253	515
Grand Total	86428	24775	37014	24639

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* Also see *Minerals*.

The world's coal resources, as assessed by the World Energy Conference, 1977, were estimated at more than $10,000 \times 10^9$ tonnes of coal equivalent (based on coal of 7000 K. Cal per kg). The Indian coal and lignite resoures, thus, constitute 0.8 per cent of the world's resources.

Mining Organisation. Consequent on the nationalisation of coal mining the Government of India re-organised the entire mining structure with the view of facilitating a rapid expansion of coal industry to meet the increasing demands of the country.

On Nov. 1, 1975 *Coal India Ltd.* was set up as a holding company with headquarters at Calcutta with five subsidiary Companies, namely, *Bharat Coking Coal Ltd., Central Coalfields Ltd., Western Coalfields Ltd., Eastern Coalfields Ltd., and Central Mine Planning and Design Institute Ltd.*, There are now one holding company and 4 coal producing companies and one subsidiary company, namely, CMPDIL, which is looking after the work of planning and design of mining projects.

The authorised capital of Coal India as a whole is Rs. 1500.00 crores. The authorised capital of coal companies is as follows:—

(Rs. in crores)

ECL	BCCL	CCL	WCL	CMPDIL
300	350	450	350	15

Bharat Coking Coal Ltd. This company has its headquarters at Dhanbad in Bihar. It has in its charge 390 nationalised mines and Sudamdih and Moonidih mines which were earlier owned by the National Coal Development Corporation. The 390 nationalised mines have been reorgainsed into 37 units. The company runs 6 coal washeries (including 4 central washeries of Hindustan Steel Ltd., which have been given to BCCL for management). Another three washeries namely Barora, Moonidih and Mohuda washeries are under construction.

BCCL is the major producer of prime coking coal, raw and washed. Medium coking coal is also produced in its mines in Mahuda and Barakar areas. Other products include hard coke and soft coke.

Eastern Coalfields Ltd. This company has its headquarters at Sanctoria, West Bengal. It covers the Raniganj coalfields in West Bengal and Mugma Rajmahal coalfields in Bihar. Eastern Coalfields produces coal to meet the requirements of loco and other industries whose requirements are for relatively higher grades of coal.

Central Coalfields Ltd. This company covers the Bokaro, Ramgarh, Giridih and north and south Karanpura coalfields in Bihar, the Talcher coalfields in Orissa and Singrauli coalfields in Madhya Pradesh and Uttar Pradesh. It owns, apart from several nationalised mines, most of the mines of the former National Coal Development Corporation Ltd. The headquarters of the Company is at Ranchi (Bihar). The company owns 57 coal mines, 4 coal washeries and a by-product coke plant. Two washeries at Ramgarh and Kedla are under construction. Its products include coking coal (raw and washed), non-coking coal, soft coke and hard coke.

Western Coalfields Ltd. This company has its headquarters at Nagpur. It covers all coalfields in Maharashtra, M.P. (except Singrauli) and Ib River coalfields in Orissa. There are 65 coal mines and one non-coking coal washery under the jurisdiction of Western Coalfields Ltd. In addition, a medium coking coal Nandan washery has been taken up. This coalfield meets largely the requirements of industries and power stations in central and western regions.

Central Mine Planning & Design Institute Ltd. This company is an independent consultative body whose function is to render expert services on mineral exploration and planning and design of mining, mineral beneficiation and coal utilisation projects. It is equipped to take up consultancy jobs in these fields both within the country and abroad. It is in charge of all such activities in respect of Coal India Ltd., besides perspective planning. The Institute has four Regional Institutes located at Asanol, Dhanbad, Ranchi and Nagpur besides its head office unit at Ranchi.

Singareni Collieries Co. Ltd. SCCL is a joint undertaking of the Govt. of Andhra Pradesh and the Government of India. The equity capital is shared in the ratio of roughly 46:54 between Central Government and State Government. The loan capital is provided entirely by Central Government. The headquarters of the Company is at Kothagudem, a well known coal town in Andhra Pradesh. The company operates all the coalmines in Andhra Pradesh. The company produces only non-coking coal. The coal requirements of consumers in the south are mostly met from SCCL.

Production & Supply. The coal production in 1981-82 has touched an all-time high level of 124.9 million tonnes (provisional) giving an increase of 9.6 per cent over the production during 1980–81, which itself was the previous best. This increase was achieved despite strikes in Singareni Collieries Co. Ltd. and law and order problems in Bengal-Bihar coal-fields.

A total of 118.00 million tonnes of coal was despatched during 1981–82 compared to 105.8 million tonnes during the corresponding period of last year. Despite substantial increase in despatches, it was possible to restrict the road despatches almost to the level of the previous year, because of improved rail movement during the year.

As on 1-4-1982, the pit-head stocks were at the record level of about 21.10 million tonnes (provisional).

Conservation of Coal. Coal is a wasting and irreplaceable natural resource. Scientific mining with proper conservation measures is extremely important for the functioning of coal industry.

The Energy Policy Committee of the Government of India estimates that the available coal reserves would last for about 90 years after 2000 AD, assuming that the annual coal production would reach a level of 400 m.t. by then and continue at that level thereafter. This calls for increased effort for scientific mining with proper conservation measures for optimum utilisation of the reserves.

Under the Coal Mines (Conservation and Development) Act, 1974, a Coal Conservation and Development Advisory Committee has been set up to advise the Government on the administration of the above Act and to disburse the financial assistance to the coal producers for undertaking conservation measures and other activities. Such assistance is funded out of the net proceeds of the excise duty on coal and coke levied under the Act, which is at present Rs. 1.65 per tonne on non-coking coal and Rs. 2.40 per tonne on coking coal.

The following table indicates the provisions made for payment of subsidy for stowing and other conservation measures to coal producing companies during the years 1979-80 to 1982-83,

Table 107

Year	*Provision (Rs. in crores)*
1979—80	14.60
1980—81	14.00
1981—82 (R.E.)	12.98
1982—83 (B.E.)	16.30

Lignite. Lignite, also known as brown coal, though inferior to bituminous coal in calorific value, is used for generation of power and production of briquettes for domestic use. It is also used for production of urea.

The average calorific value of lignite is around 2400 K. Cal/kg. Though it has a high percentage of moisture (50 to 60 per cent), the ash content is low, 3-6 per cent.

Neyveli, a small village in the District of South Arcot of Tamil Nadu State, sprang into limelight overnight in the early 1950's when lignite was discovered. On investigation a reserve of 2000 million tonnes of lignite was estimated to be available at Neyveli. Further investigations were continued and as on date (1982) the estimated reserves extend to 3300 m.t.

Neyveli Lignite Corporation was registered as a public sector company in November 1956, with the object of taking over, implementing and managing the integrated project consisting of an opencast lignite mine with an ultimate capacity of 6.5 m.t. of lignite per annum, a 600 MW thermal power station, a fertilizer plant with a rated capacity to produce 1.52 lakh tonnes of urea per year, a briquetting and carbonisation plant to produce 3.27 lakh tonnes of carbonised briquettes per annum and a clay washing plant with a capacity of 6000 tonnes of washed clay per annum.

The impressive trend of productivity and all-round progress achieved during 1980-81 has been maintained by the Corporation during 1981-82. The following table indicates the achievements made by the Corporation during 1981-82 over 1980-81 and 1979-80.

Table 108

Neyveli Lignite*

Items	*Targetted production 1981-82*	*Actual for 1981-82*	*Actual for*	
			1980-81	*1979-80*
Lignite (LT)	55.00	58.76	48.01	28.97
Power (Gross) (MU)	3177.00	3390.65	2810.00	2096.00
Leco (T)	110,000.00	125,292.00	75,151.00	25,748.00
Urea (T)	95,000.00	98,260.00	134,334.00	104,908.00

**Source:* Ministry of Energy.

Table 109

Coal & Lignite Statistics

	1979-80	*1980-81*	*1981-82*
Production			
			Million tonnes
(a) Coking Coal	23.50	24.41	26.47
(b) Non-Coking Coal	80.45	89.60	98.44
(c) Total Coal	103.95	114.01	124.91
(d) Lignite	2.90	4.80	5.88
(e) Washed Coal	10.72	11.55	11.06 (upto 28-2-82)
(f) Soft Coke	2.41	2.26	2.26
(g) Hard Coke	0.76	0.78	0.91
			Lakh tonnes
(h) Leco (NLC)	0.25	0.77	1.25
(i) Urea (NLC)	1.04	1.34	0.98
			M. KWH
(j) Power Generation	2096	2810	3391
Despatches			
			Million tonnes
(a) Coking Coal	21.33	22.16	23.90
(b) Non-Coking Coal	78.25	83.60	94.10
(c) Total Coal	99.58	105.76	118.00
Export:	0.09	0.11	0.15 (up to 28-2-82)

Source: Ministry of Energy (Dept. of Coal).

119. OIL & GAS*

Although oil was discovered in Assam in 1867, some seven years after the first oil well in USA was opened in Pennsylvania by Col. Drake, no effort was made either to augment Assam production or to enquire into its potentialities. It was only in 1955 that the Government of India formed a Directorate under the then Ministry of Natural Resources and Scientific Research to investigate into the country's oil resources. In 1956 the Directorate was elevated to the status of a Commission. In 1959 the Commission was converted into a statutory body by an Act of Parliament. This is the Oil and Natural Gas Commission.

The *Oil and Natural Gas Commission* (ONGC) is the principal agency engaged in the exploration, development and production of crude oil and natural gas in the country. Its field of activity extends over the entire territory of India including the continental shelf. Some areas presently operated by the Assam Oil Company and Oil India Ltd. are beyond the purview of the ONGC.

Oil India Limited (OIL) was formed in February, 1959 for exploration and production of crude oil (including natural gas) in Assam and Arunachal Pradesh in collaboration with Burmah Oil Company Limited. With effect from 14th October 1981 the Government has taken over 50 per cent of shares of Oil India Limited held by Burmah Oil Company Limited and the Indian assets and liabilities of Assam Oil Company Limited and Burmah Oil Company (India Trading) Limited, for a total consideration of Rs. 21.56 crores.

With the takeover of the Assam Oil Company, the Burmah Oil Company (India Trading) Limited and 50 per cent shares of Oil India Limited (owned by Burmah Oil Company Limited) the oil industry in the country is entirely in public sector.

The *Institute of Petroleum Exploration* at Dehra Dun carries out basic and applied research in petroleum. They have identified 27 basins covering a total sedimentary area of about 1.4 million sq. km on land and about 0.26 million sq. km offshore. The Brahmaputra Valley in Assam and Cambay in Gujarat have proved to be rich in oil and gas. The actual exploration is carried out by ONGC and Oil India, both onshore and offshore.

Pricing. The current arrangement of pricing of domestic crude oil and refined petroleum products is based on the recommendations of the Oil Prices Committee (November 1976) as accepted by the Government.

A revision in the prices of petroleum products took place on January 13, 1981. The price of indigenously produced crude oil was increased from Rs. 324.41/tonne for onshore crude and Rs. 458.50/tonne for offshore crude oil to Rs. 1182/tonne for both onshore and offshore oil with effect from 11th July, 1981 (after taking due account of the customs Excise Duty generation).

ONGC. The ONGC produced 7.032 million tonnes (3.098 MMT onshore and 3.934 MMT offshore) of crude oil and condensate during the period April to October, 1981 against the target of production of 13.90 million tonnes for the whole year 1981-82. During the same period the ONGC supplied 656.39 million cubic metres of natural gas to various consumers in Bombay, Gujarat and Assam against the annual target of 1488 million cubic metres.

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* Also see *Minerals*.

Onshore. 101,736 metres were drilled till October, 1981 against the annual target of 237,700 metres. Drilling and production testing continued on 37 structures. The ONGC undertook drilling in five new structures, Jaksana, Kherwa and Nadsa in Gujarat, Jaguli in West Bengal and Namti in Assam. Altogether 54 wells were completed till October 1981.

Offshore. During the period till October, 1981 the ONGC has drilled 57,335 metres comprising 21,317 metres of exploratory drilling and 36,018 metres of development drilling against the target for the year of 1,26,300 metres. The ONGC commenced drilling on three new structures in the offshore areas during the current year and oil and gaswas struck in two of these structures viz. B-57 and PH 9. Drilling and/production testing was continued in five structures in this period and 26 wells were completed.

OIL*. Oil India Limited became a wholly New Environment Enterprise from October 14, 1981 when the Government acquired the 50 per cent equity share holding of the Burmah Oil Company Ltd.

The Company holds mining leases and petroleum exploration licences (PEL) in the following areas:

(a) Mining Lease areas in Assam	—1,990 sq. km
(b) Petroleum Exploration Licence area in Arunachal Pradesh	— 551 sq. km
(c) Mahanadi Basin (offshore)	—12,000sq.km
(d) Mahanadi Basin (onshore)	—6,800 sq. km

The Digboi oil fields areas covering about 52 sq. km were transferred to Oil India from the erstwhile Assam Oil Co. Ltd. with effect from October 14, 1981.

Refining & Distribution. The total refining capacity in the country at present in terms of crude throughput is 31.80 million tonnes per annum. There are eleven refineries in operation. With the takeover of Digboi refinery of the Assam Oil Company on October 14, 1981 all the refineries are in the public sector. The refineries and their installed capacities are tabulated below:—

Table 110

Refineries

Name of the Company	*Location*	*Installed Capacity (MTPA)*
Indian Oil Corporation Limited	Gauhati	0.85
—do—	Barauni	3.30
—do—	Koyali	7.30
—do—	Haldia	2.50
Madras Refineries Limited	Madras	2.80
Cochin Refineries Limited	Cochin	3.30
Bharat Petroleum Corpn. Limited	Bombay	5.25
Hindustan Petroleum Corpn. Limited	Bombay	3.50
—do—	Vizag	1.50
Bongaigaon Refinery & Petro-chemicals Ltd.	Bongaigaon	1.00
Assam Oil Division of Indian Oil Corporation	Digboi	0.50
Total		31.80

With the recent commissioning of the 6 MTPA Mathura Refinery, the total refining capacity in the country will increase to 37.80 million tonnes.

IOC. The Indian Oil Corporation Limited was set up on September 1, 1964 by amalgamating the Indian Refineries Limited with the Indian Oil Company Limited to secure effective co-ordination and control between the refining and marketing activities of the two companies. The Corporation has two divisions, viz. (i) Refineries and Pipelines Division; and (ii) Marketing Division; following the takeover of the interests of Assam Oil Company and Burmah Oil Company (IT), the business of refining, marketing and distribution of petroleum products of the Assam Oil Company and the Burmah Oil Company (India Trading) has been entrusted to the Indian Oil Corporation in accordance with the vesting order dated October 13, 1981 issued by the Government; these are being kept as a separate division, the Assam Oil Division, of the Indian Oil Corporation Limited.

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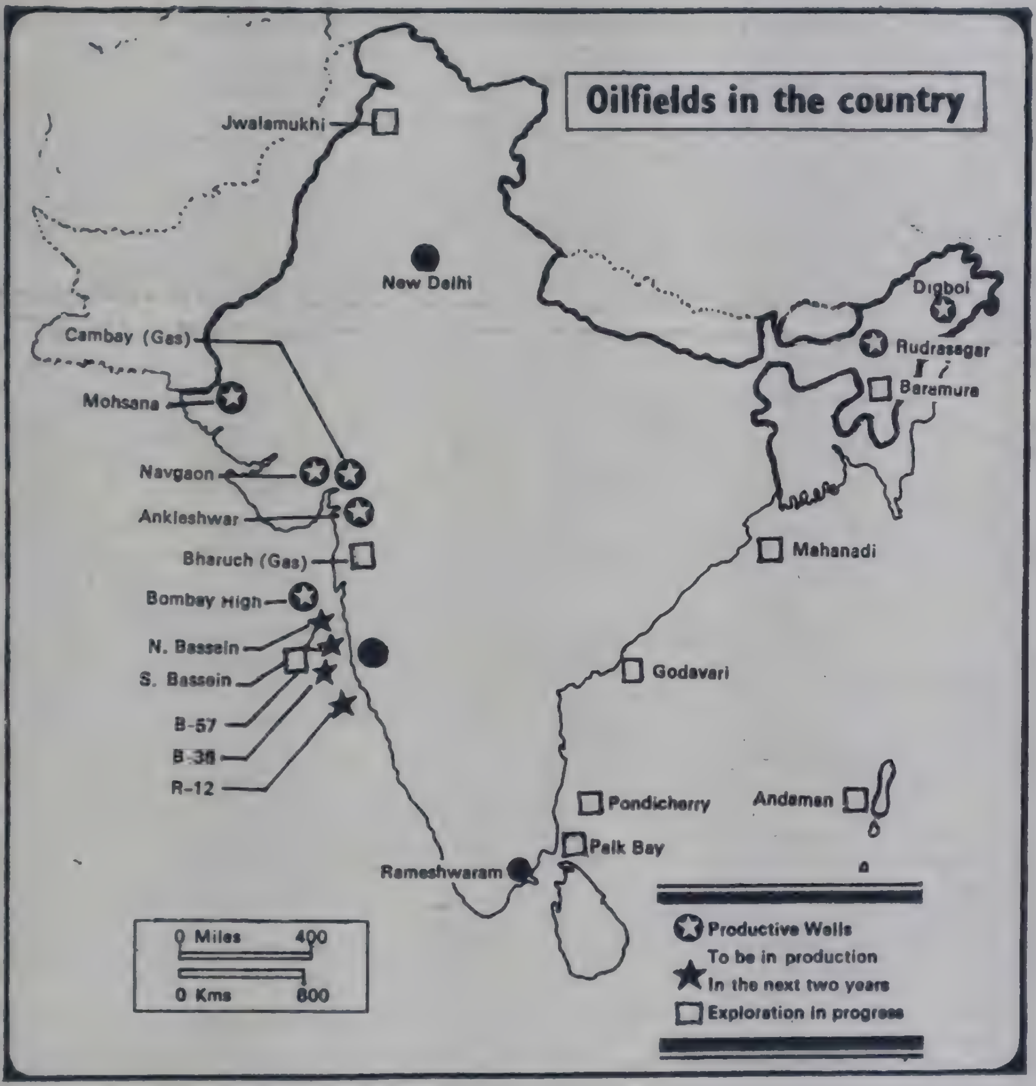
* Short for Oil India Ltd.



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Oil Struck off Pondy

Oil with gas, has been struck for the first time in the Porto Novo structure, 40 km off the Pondicherry coast, in the fourth well of the area.

Gas was struck earlier in one of the two wells taken up for drilling by the Oil and Natural Gas Commission in 1980.

Tests are being conducted to determine the flow rate in the new well, spudded on July 27, on a location selected on the basis of analysis of the data collected in the last two years.

Porto Novo is north of Palk Straits where oil was struck a year ago in the first well at a flow rate of 1050 barrels a day. The next two wells in the Straits showed traces of oil or gas. The ONGC then moved in to drill the fourth and fifth wells there—PTI.

New Delhi, Sept. 9, 1982.

BPCL. Bharat Petroleum Corporation Ltd. During the year 1980–81, the Bharat Petroleum Corporation earned a profit before tax (after taking into account interest and other miscellaneous income) of Rs. 23.11 crores compared to Rs. 24.82 crores during 1979–80. After making provision for tax and other adjustments, the results show a surplus of Rs. 10.79 crores (Rs. 11.10 crores during 1979-80). The company has paid dividend at the rate of 14 per cent on equity shares amounting to Rs.2,03,53,669 compared to 12 per cent in 1979–80.

HPCL. Hindustan Petroleum Corporation Ltd. The Hindustan Petroleum Corporation Limited, a public sector undertaking, achieved a total sales of petroleum products during 1980–81 of 5.592 million tonnes compared to 5.158 million tonnes during 1979–80 reflecting an increase of 8.4 per cent. The sales turnover during 1980–81 was Rs. 1573.83 crores as against Rs. 1103.67 crores during 1979–80.

CRL. Cochin Refineries Ltd. was incorporated on September 6, 1963 with a designed capacity to process 2.5 million tonnes of crude per annum, which, after the expansion of the refinery in August, 1973 was raised to 3.3 million tonnes per annum. The products of the refinery, viz., Liquid Petroleum Gas, Naphtha, ATF, Motor Spirit, Superior Kerosene, High Speed Diesel, Light Diesel Oil, Furnace Oil and LSHS and Asphalt are sold to the Indian Oil Corporation Ltd. who are the nominees of the Government of India for marketing the products.

Government of India holds 52.83 per cent equity shares in the Company, Phillips Petroleum of USA holds 26.43 per cent, Government of Kerala 7.14 per cent and the remaining 13.6 per cent are held by institutions such as Life Insurance Corporation and the public.

During the financial year 1980–81, 2.912 million tonnes of crude oil was processed.

MRL. Madras Refineries Ltd. was incorporated on the 30th December, 1965. Government of India holds 74 per cent of the shares and the remaining 26 per cent are held equally between National Iranian Oil Corporation of Iran and AMOCO Export Incorporated, U. S. A. The Company has a refinery at Madras which has an installed capacity of 2.8 million tonnes. The products of the refinery are sold to I. O. C.

During the year ended 31st March, 1981, the refinery processed 2.611 million tonnes of crude oil as against 2.822 million tonnes in the previous year.

Petrochemicals. Indian Petrochemicals Corporation Limited was incorporated on 22nd March, 1969. It has established a large integrated petrochemical complex near Vadodra. The plants in the complex produce a variety of polymers, fibre and fibre intermediates and chemicals. Several of its products have been produced for the first time in the country.

Another company in the public sector, *Bongaigaon Refinery and Petrochemicals Ltd.* (BRPL) was registered in 1974. It has a 1–million-tonne refinery and a petrochemicals complex at Bongaigaon in Assam. The refinery comprises a crude distillation unit, a kerosene treating unit, a coker and a coke calcination unit.

There are two companies in private sector: *Union Carbide India Ltd.* which went into production in 1967 and *National Organic Chemicals Ltd* (NOCIL) which started functioning in 1968.

Table 111

Crude Oil Production

('000 Tonnes)

Item	*1970–71*	*1975–76*	*1979–80*	*1980–81*	*1981-82 (April-Dec.)*
Total Production	6822	8448	11768	10505	11558
(a) On-Shore					
AOC	104	66	40	48	2276
OIL	3084	3103	2215	1241	
ONGC	3634	5279	5091	4231	3903
Total (a)	6822	8448	7346	5520	6179
(b) Off-Shore ONGC	—	—	4422	4985	5379

120. MINERALS

Minerals of various types appear to have been mined and used in India from Indus Valley times. Kautilya (4th century B.C.), minister of Chandragupta Maurya, wrote in his *'Artha Sastra'* that "minerals are sources of wealth, armies can be raised on wealth and the King who has wealth and armies can conquer the world". With such an awareness of the importance of minerals, it is hardly surprising that the ancient Indians excelled in utilizing them. The rustless iron Pillars of Asoka are a standing monument to the mastery and skill of ancient Indian metal workers. Medieval India achieved a high degree of proficiency in metallurgy especially in alloys. The slag heaps of iron and steel and slags of metals like zinc, lead, copper and gold and to a smaller extent silver and cobalt found in certain parts of Rajasthan and Bihar provide ample evidence of a flourishing metal industry in the past. Of course, the ancients were content to exploit only the small easily accessible deposits of metals that were known in those days. Minerals such as coal, oil, chrome-ore, manganese, mica, ilmenite etc. were almost untouched till the end of the 18th century, when European businessmen in India set about exploiting them.

Wide Range of Minerals. The mineral resources of India today are extensive and cover a wide range of substances. But some vital minerals are totally absent in India. The available minerals themselves are quite unevenly distributed over the country. Bihar and Orissa are the leading States of India in mineral wealth. They contain the largest concentration of ore deposits, such as iron, manganese, mica and coal. MP comes next with good reserves of iron and manganese ores, coal, limestone and bauxite. T. Nadu has workable deposits of iron, manganese, mica, limestone and lignite. Karnataka produces fairly good quantities of iron, porcelain clays, chrome-ores and gold. Kerala possesses extensive mineral sands of strategic importance, containing ilmenite, monazite, zircon, rutile and garnet in workable quantities. Rajasthan has recently emerged as a great producer of non-ferrous metals—copper, lead, zinc, uranium, mica, steatite, beryllium and precious stones like aquamarine and emerald. AP has sizeable quantities of second grade coal and several other industrial minerals. Gujarat and Assam provide the major supply of petroleum products. Assam, including Nagaland and Meghalaya, has important reserves of coal, sillimanite and other minerals. West Bengal's mineral resources are confined to coal and iron. Kashmir has coal, aluminium ore, sapphires and some other industrial minerals. UP, Punjab and Haryana have not yet appeared as producers of any valuable mineral.

Indian Bureau of Mines (IBM), established in 1948 with its headquarters at Nagpur, is responsible for compilation of all mineral data and statistics for ensuring conservation and proper utilisation of mineral resources and enforcement of Mineral Conservation and Development Rules, 1958. The Bureau is also equipped to carry out research on ore dressing and mineral benefication.

Mineral Exploration Corporation Ltd. (MEC), a public sector organisation, was set up in Aug. 1972 with its headquarters at Nagpur. Its main task is to undertake exploration of the mineral resources of the country.

The Council of State Mineral Corporations (COSMIC) was registered as a Society on Aug. 20, 1976 and was formally inaugurated on September 22, 1976. Its main objective is to co-ordinate, develop and promote the activities of State Mineral Corporations, on a national basis. The State Mineral Corporations which were formed in the various States are members of this council. The Council held the first All India Mineral Conference on July 3, 1977 at Delhi.

Mineral Resources. The occurrence of minerals in India varies greatly in quantity and quality. In some minerals, India has enough to spare for exports. They include Barytes, Bauxite, China Clay, Chromite, Coal, Corundum, Dolomite, Felspar, Fireclay, Garnet, Gypsum, Ilmenite, Iron, Kyanite, Limestone, Magnesite, Manganese, Mica, Pyrites, Titanium ore and Thorium ore. Minerals and metals in which India is deficient are Antimony, Arsenic, Asbestos, Bismuth, Borax, Cadmium, Cobalt, Graphite, Lead (ore and metal), Mercury, Molybdenum, Nickel, Oil (Crude), Platinum, Phosphates, Tin, Tungsten and Zinc (ore & metal).

Classification of Minerals. Minerals fall into three major groups: (1) *Fuel Minerals*, comprising coal, lignite, natural gas and petroleum, (2) *Metallic Minerals* consisting of bauxite, chromite, copper, gold, iron, manganese etc. and (3) *Non-Metallic Minerals* like Barytes, China clay, Dolomite, Limestone, Magnesite, Kyanite, Sillimanite, Steatite and others.

During 1980, mineral fuels accounted for Rs. 1686 crores or 78.6 per cent of the total production, metallic minerals Rs. 211 crores or 9.8 per cent and non-metallic minerals Rs. 249 crores or 11.6 per cent.

Geological Survey of India (GSI), established in 1851, is a large multi-disciplinary scientific organisation for carrying out geological mapping, mineral investigations and geotechnical investigations in the country. It also conducts research, both fundamental and applied, in all the branches of the earth sciences, besides special investigation in glaciology, environmental geology and geothermal studies. The department is also engaged in mapping of the continental shelf and airborne geophysical surveys in different parts of the country to locate new areas of mineralisation.

GSI has so far surveyed 46.4 per cent of the total area of India and has prepared geological base maps. Concurrently it has been carrying on exploration, reassessment and evaluation of known mineral deposits and searching for new finds of important mineral ores.

Mineral Production. The total value of minerals produced in India has been steadily on the increase. In 1981 it is expected to record an all time high level of Rs 3140 crores, showing an increase of 42 per cent over the previous year. Of this, fuels account for Rs. 2632 crores, or 83.8 per cent, metals for Rs. 249 crores or 7.9 per cent and non-metals for Rs. 259 crores or 8.3 per cent.

During 1981, Bihar state continued to occupy the first place in the production of minerals accounting for 23.6 per cent of the total value of minerals followed by Bombay High (16.9 per cent), Madhya Pradesh (11.9 per cent), Assam (10.7 per cent), Gujarat (9.6 per cent), and West Bengal (8.1 per cent).

Table 112

Production Of Important Minerals

Mineral	*Unit of Qty/Value*	*1980*	*1981**	*1982† Jan—Mar.*
All Minerals (Value)	Rs. 000	22,058,360	31,395,200	10,943,941
Fuels				
Coal	000 Tonnes	109,100	118,917	36,866
	Rs. 000	12,989,333	14,401,811	4,464,757
Lignite	Tonnes	4,549,000	5,642,000	1,756,000
	Rs. 000	427,529	534,909	166,439
Natural Gas	Mil-cu-mtrs	1462	1940	480
	Rs. 000	57,277	67,226	16,633
Petroleum (Crude)	Tonnes	9,397,000	14,373,000	4,145,000
	Rs. 000	3,664,250	11,310,219	4,899,050
Metallic Minerals				
Bauxite	Tonnes	1,775,000	2,124,194	651,706
	Rs. 000	80,352	89,205	27,368
Chromite	Tonnes	321,000	322,761	109,732
	Rs. 000	130,956	140,494	47,765
Barytes	Tonnes	434,000	303,764	61,320
	Rs. 000	36,758	20,634	4165
Kaolin	Tonnes	452,000	546,105	157,908
	Rs. 000	40,015	44,514	12,871
Diamond	Carats	14,432	14,089	3563
	Rs. 0C0	20,442	14,028	3548
Dolomite	Tonnes	2,018,000	1,810,879	466,742
	Rs. 000	87,378	74,305	19,152
Fireclay	Tonnes	737,000	740,203	239,963
	Rs. 000	16,453	16,318	5290

Copper	Tonnes	2,005,000	2,109,007	484,003
	Rs. 000	326,846	347,028	79,641
Gold	Kilograms	2452	2307	621
	Rs. 000	186,157	248,640	66,896
Iron Ore	Tonnes	40,925,000	41,050,000	12,756,000
	Rs. 000	1,160,777	1,218,237	378,565
Lead Conc.‡	Tonnes	16,616	19,926	4988
	Rs. 000	47,397	57,991	14,517
Manganese Ore	Tonnes	1,666,000	1,504,682	405,821
	Rs. 000	233,978	232,094	62,597
Silver	Kilograms	11,381	14,815	5010
	Rs. 000	25,221	32,892	11,123
Zinc Conc.‡	Tonnes	46,294	50,312	9903
	Rs. 000	111,609	121,641	23,943
Non-Metallic Minerals				
Apatite	Tonnes	20,000	13,283	3723
	Rs. 000	4313	2977	834
Phosphorite	Tonnes	523,000	465,782	165,002
	Rs. 000	197,663	194,410	68,869
Asbestos	Tonnes	32,468	23,232	6891
	Rs. 000	10,653	11,638	3452
Calcareous Sand	Tonnes	772,000	639,955	155,504
	Rs. 000	8693	6931	1684
Magnesite	Tonnes	385,000	466,139	109,617
	Rs. 000	62,208	84,520	19,876
Mica (Crude)	Tonnes	7930	8365	2153
	Rs. 000	27,056	29,980	7715
Pyrites	Tonnes	82,905	44,466	12,447
	Rs. 000	32,236	15,952	4465
Sillimanite	Tonnes	14,486	9467	3314
	Rs. 000	4707	4679	1638
Steatite	Tonnes	332,000	314,067	86,081
	Rs. 000	22,216	24,387	6684
Fluorite Conc.	Tonnes	17,158	17,125	4605
	Rs. 000	26,146	26,328	7080
Fluorite Graded	Tonnes	4049	3644	1066
	Rs. 000	4738	4092	1197
Gypsum	Tonnes	868,000	982,416	308,277
	Rs. 000	26,968	22,964	7206
Kyanite	Tonnes	48,740	36,414	10,945
	Rs. 000	14,335	12,372	3719
Limestone	Tonnes	29,211,000	30,517,003	7,886,000
	Rs. 000	729,334	745,380	192,609
Limekankar	Tonnes	9000	9057	2430
	Rs. 000	85	26	7
Limeshell	Tonnes	109,000	126,930	28,419
	Rs. 000	5837	8978	2010
Minor Minerals (Value)	Rs. 000	1,164,394**	1,164,394**	291,100
Other Major Minerals (Value)	Rs. 000	74,050	63,006	19,476

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* Provisional † Estimated ** Estimated on previous year's basis.

Note: (i) The value figures pertain to the pit-head value.
(ii) Data except for coal, Lignite Petroleum (Crude), Natural Gas and Minor Minerals are based on the return received under M. C. D. R., 1958 by the Indian Bureau of Mines.
(iii) Figures for the previous years have been revised wherever necessary.

Source: Ministry of Steel & Mines.

Export & Import of Minerals. The total value of exports of minerals declined from Rs. 979.28 crores in 1978 to Rs. 871.79 crores in 1979. Diamond (mostly cut) and precious and semi-precious stones were the principal minerals exported from India and their share in the total export earnings in 1979 was Rs. 481.04 crores or 55 per cent followed by iron ore Rs. 272.33 crores or 31 per cent and mica Rs. 25.03 crores or 3 per cent. During January to June, 1980, the total earnings from the exports of minerals from India was Rs. 456.97 crores. Among the minerals exported during this period, diamond (mostly cut) and precious/semi-precious stones were leading and their share in the total value was Rs. 210.13 crores or 46 per cent followed by iron ore Rs. 183.14 crores or 40 per cent and stones (building and monumental granite etc.) Rs. 13.28 crores or 3 per cent.

The total value of imports of minerals increased from Rs. 1816.12 crores in 1978 to Rs. 2360.67 crores during the year 1979. In terms of value petroleum (crude) accounted for Rs. 1790.32 crores or 76 per cent in the total value of imports followed by diamond (uncut) Rs. 343.54 crores or 15 per cent during 1979.

During the first-half of 1980, the total value of minerals imported into India was Rs. 1718.70 crores; petroleum (crude) and diamond (uncut) were the important minerals imported during this period and their share in the total value was 81 per cent and 12 per cent respectively.

48

Uranium Production

India proposes to increase Uranium production to meet the increased requirement of the nuclear power programme, reports UNI.

The state-owned Uranium Corporation of India (UCIL) has plans to expand and open two more deposits at Narwapahar and Turamdih which are located in the mineralised belt known as Singhbhum thrust belt of Bihar. Besides, the company will also open another deposit at Bodal in Madhya Pradesh, according to official sources.

According to experts, India has an excellent potential for discovering new additional resources of uranium.

Feasibility studies for opening up of the deposits at Narwapahar and Turamdih have been completed and detailed development designs are under formulation.

New Delhi, Nov. 28, 1982.

121. METALS

Steel. Steel is today acknowledged as a basic input material for industrial development and its per capita consumption is often regarded as an important indicator of the level of economic progress made in a country. In recognition of its crucial role, therefore, sustained efforts have been made to augment the steel-making capacity in India. From an installed capacity of a mere 1.3 million tonnes of ingot steel and that too in the private sector, during the first Five-Year Plan, the country has forged ahead significantly. At present the steel-making capacity stands at 14.6 million tonnes of ingots per year of which 11.4 million tonnes are accounted for by the integrated steel plants* and 3.6 million tonnes by the mini steel plants. In 1980 India ranked 16th among the major steel-producing countries in the world.

Though India has a small share of the total world output of crude steel which was 707.3 million tonnes in 1981, it is a leading steel producer amongst the Third World countries. While the production of crude steel in countries like Belgium, Brazil, Romania, South Korea and Spain was slightly higher than that of India, it was lower in certain other countries like South Africa, Australia, Mexico and the German Democratic Republic. The USSR maintained its position as the top producer with 149 million tonnes, while USA beat Japan for the second place. In spite of a significant increase our steel consumption remained at around 15 kg per capita as against the figure of around 600 kg in the industrially advanced countries of the world.

Steel Plants. The table below shows the installed capacity of each integrated steel plant in the country:—

Table 113

		Rated Capacity (in million tonnes)	
Name of the Plant		*Ingot steel*	*Saleable steel*
Bhilai	—	2.5	1.96
Durgapur	—	1.6	1.23
Rourkela	—	1.8	1.22
Bokaro	—	2.5	1.97
IISCO	—	1.0	.8
TISCO	—	2.0	1.5
Total		11.40	8.7

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* See below

Of these six integrated steel plants, the first five are in the public sector, owned and controlled by the Steel Authority of India Ltd. Together they account for a capacity of 9.4 million tonnes of ingot steel per year. The product-mix of the integated steel plants is designed to serve the needs of diverse sectors of the economy and includes blooms, slabs, billets, bars, light, medium and heavy structurals, rails, sleepers, wheels and axles, and galvanised and tin-plated sheets. Approximately 40 per cent of the steel produced by these plants is oriented to meet the demand of civil construction, 50 per cent of engineering industry and 10 per cent of the miscellaneous groups.

The steel industry in India is poised for substantial growth during the eighties. It is estimated that the demand for steel will go up to 12.7 million tonnes by 1984-85 and to 18.4 million tonnes by 1989-90. The main thrust will be on bars, rods, structurals, plates and hot and cold-rolled sheets. To meet the upsurge in demand, it is planned to raise the installed capacity of crude steel in the integrated steel plants to nearly 20 million tonnes by 1989-90.

Production 1981-82. The year 1981-82 may be called the year of recovery for the Indian steel industry. Production of crude steel at the integrated steel plants increased by 19.7 per cent during April 1981—January 1982 compared to the corresponding period of the previous year. The contribution of mini steel plants during April 1981—December 1981 was 1.53 million tonnes as against 1.47 million tonnes in the corresponding period of the preceding year. The performance of Indian steel industry gains special significance against the background of the declining trend in steel production the world over. In 1980 the world crude steel production was 718 million tonnes as compared to 747.5 million tonnes in 1979. The estimated production of 707.3 million tonnes in 1981 indicates a further drop of 1.4 per cent in world production as compared to 1980.

49

Stainless Steel Consumption up

The stainless steel consumption in the country had risen from 18,500 tonnes in 1971 to 69,000 tonnes in 1981; while the production which was 3000 tonnes in 1971 had gone up to 55,000 tonnes, with the Salem Steel Plant accounting for 3124 tonnes in 1981-82, according to Mr. A. A. Raju, executive director, Salem Steel Plant.

Salem, Dec. 4, 1982, (PTI).

The extent of increase in the production of ingot steel and saleable steel and saleable pig iron during 1981-82 over the previous year in India is brought out by the following figures.

Table 114

Steel & Iron Products

	Production (in million tonnes)		*Present Increase*	*Capacity utilisation*	
	1980-81	*1981-82*		*1980-81*	*1981-82*
Ingot steel	7.35	8.90	21%	64%	78%
Saleable steel	6.28	7.30	16%	72%	84%
Saleable Pig Iron	1.34	1.30	Nil	*	*

* No capacity as such.

Steel Authority of India Ltd. (SAIL). In the steel sector, Steel Authority of India Ltd. is the premier industrial enterprise. It is a fully owned company of the Government of India. The company is responsible for the management of 5 public sector integrated steel plants located at Bhilai, Rourkela, Durgapur, Bokaro and Burnpur. At present the annual rated capacity of these plants is 9.4 million tonnes of ingot steel and is expected to be stepped up to 12.4 million tonnes by 1984-85. Besides these plants, SAIL has two alloy steel plants at Durgapur and Salem. Durgapur Alloy Steels Plant has an annual capacity of 1 lakh tonnes while the corresponding capacity for Salem is 32,000 tonnes of stainless steel.

Production of steel in the integrated steel plants is supplemented by production in 147 mini steel plants which have a total licenced capacity of 3.3 million tonnes of ingot steel. The actual production from mini steel plants during April-December, 1981 was 1.53 million tonnes and the total production during 1981-82 is estimated at 2.82 million tonnes in terms of ingots. The total anticipated production of saleable steel in the country during 1981-82, including the production from mini-steel plants is expected to be 8.1 million tonnes.

Export of iron and steel is canalised through SAIL. Ferrous scrap export is canalised through MSTC. During the year 1981-82, exports have been negligible.

Table 115

Import of Iron and Steel*

(Quantity in tonnes and value in Rs. '000)

Category	*1979-80*	*1978-79*	*1977-78*
	Quantity		
Pig iron, Sponge iron etc.	1422	879	1054
Ferro alloys	4497	5172	1060
Carbon Steel	1699193	795369	321936
High Carbon Steel	188620	90037	47993
Alloy Steel	458681	164968	58573
Rails and Rly. material	155474	4947	7113
Iron & Steel Scrap	147355	206476	56342
Total	2655242	1267848	494071
	Value		
Pig iron, Sponge iron etc.	6070	4666	5203
Ferro alloys	120591	60930	22394
Carbon Steel	4048538	2386286	1097321
High Carbon Steel	804007	357344	194492
Alloy Steel	2133399	796536	459430
Rails and Rly. material	209676	35348	56536
Iron and Steel Scrap	289776	237875	120705
Total	7612059	3878985	1956081

Source: Ministry of Steel.

The Indian Iron and Steel Co. Limited comprises an integrated iron and steel plant at Burnpur, two spun pipe plants at Kulti, collieries at Chasnala, Nundi-Hitpur and Ramnagore, iron ore mines at Gua and Manoharpur and a phosphate rock mine at Pathergorah.

Owing to mismanagement and financial difficulties, the Govt. of India took over the management of the Company in July 1972. In 1976 the government acquired all shares held by private parties in the company under the Indian Iron and Steel Co. (Acquisition of Shares) Ordinance later replaced by The Indian Iron and Steel Co. (Acquisition of Shares) Act, 1976. The shares held by the Govt. of India were transferred to the Steel Authority of India Ltd. in May 1978.

IISCO have suffered heavy losses during the last few years as given below:

Table 116

IISCO Losses

Year			*Loss (In crores of Rupees)*
1977-78	....	....	(—)39.13
1978-79	....	....	(—)24.31
1979-80	....	....	(—)34.94
1980-81	....	....	(—)29.78 (estimated excluding interest on Govt. loans)
1981-82	....	....	( )30.97 (estimated)

Visvesvaraya Iron & Steel Ltd. The Mysore Iron and Steel Works, Bhadravati, was started in 1923 as a departmental undertaking of the State Government with a small blast furnace to produce about 24,500 tonnes of pig iron annually. It was converted into a company on 30th June, 1961 under the name of Mysore Iron and Steel Limited. In February, 1976, its name was changed to Visvesvaraya Iron and Steel Limited. It is now jointly owned by the Government of Karnataka and the Govt. of India (through Steel Authority of India Limited). It is one of the main producers of alloy and special steels in the country. Other products of the company are mild steel, ferro silicon, cement, castings, spun pipe and ferro alloys.

Private sector. The only iron and steel company in the private sector is the *Tata Iron and Steel Company Ltd.*

The industrial complex of Tata Iron and Steel Company Limited consists of the iron and steel plant at Jamshedpur, captive collieries at Sijya, Jamadoba and West Bokaro and an iron ore mine at Noamundi. The Steel Plant at Jamshedpur is the oldest integrated steel plant in the country. It has an installed capacity of 2 million tonnes per annum of steel ingots equivalent to 1.5 million tonnes of saleable steel.

TISCO has been operating at more than 90 per cent capacity and produced 1779 thousand tonnes of steel ingots and 1447 thousand tonnes of saleable steel in 1979-80, although the company was bedevilled by shortage of coking coal and severe power restrictions imposed by the Damodar Valley Corporation. Out of the production in 1979-80 TISCO exported 7300 tonnes of steel.

Mini Steel Plant. In the earlier period of industrial development in the country, the electric furnaces used to cater mainly to the demand of the foundries. The acute shortage of steel in 1970 and the post-recession industrial 'pick up' resulting in a sharp increase in the demand for steel by the rerolling and the engineering industries gave a temporary push to the electric furnace industry. Government encouraged the augmentation of steel production through establishment of small or medium-sized electric furnaces by utilising scrap raw material which was being mostly exported at that time.

Non-Ferrous Metals

Aluminium. The only non-ferrous metal in which India has a large installed capacity, enough to meet the country's demand, and for which there are very extensive deposits of ore, is aluminium. Unlike in developed countries, aluminium finds extensive use in the distribution of electrical energy in the country. About 55 per cent of the total production of aluminium is used for the manufacture of cables and conductors required for the power industry. The importance of this metal and the demand for it will, therefore, increase rapidly in the coming years because of the proposed very large investments and high priority given to the power sector by Government. It has been estimated that by 1987-88 the demand for the metal will be 595,000 tonnes.

There are at present 6 companies in India engaged in processing aluminium. One is a public sector concern, Bharat Aluminium Company at Korba BALCO (Madhya Pradesh) and Ratnagiri (Maharashtra). The private sector companies are: Indian Aluminium Company, Ltd. INDAL at Hirakud (Orissa), Alwaye (Kerala) and Belgaum (Karnataka), Hindustan Aluminium Co. Ltd. HIND-ALCO at Renukoot (U.P.), Madras Aluminium Co. Ltd. MALCO at Mettur (Tamil Nadu) and the Aluminium Corporation of India Ltd. at Asansol (W. Bengal). The National Aluminium Company Limited (NALCO) was formed on 7-1-1981, with an authorised capital of Rs. 200 crores, to implement the Rs. 1242.4 crores Alumina/Aluminium Project in Orissa

Copper. India does not have many rich deposits of copper ore. However, in order to minimise dependence on imports Hindustan Copper Limited (HCL) wss constituted on 9-11-1967 with the specific responsibility of developing the various copper deposits in the country. Subsequently, the undertaking of the Indian Copper Corporation Ltd., Singhbhum (Bihar), was taken over by government in 1972 and entrusted to Hindustan Copper Limited. Since then, copper has been a fully nationalised industry.

HCL has two main projects in operation viz. Indian Copper Complex at Ghatsila, Bihar and Khetri Copper Complex at Khetri, Rajásthan. The other ongoing projects of the company are Rakha in Bihar & Dariba & Chandmari in Rajasthan. The major project of the company under construction is Malanjkhand in Balaghat District, Madhya Pradesh.

The Indian Copper complex has a copper smelter of 16,500 tonnes capacity per annum fully supported by mines. The Khetri Copper project has a designed capacity of 31,000 tonnes copper per annum and 1,94,000 tonnes of triple super phosphate as byproduct. The Malanjkhand Copper project, Madhya Pradesh, is the country's first large size open-cast mine in hard rock and has been designed for an ultimate production of about 23,000 tonnes of metal per year.

Zinc & Lead. Hindustan Ltd. is the only public sector undertaking, working zinc and lead. It was incorporated in January 1966. The principal objects of this Company are mining and smelting of lead-zinc metal and production of allied products. The authorised capital of the Company is Rs. 125 crores with the paid-up capital of Rs. 106.20 crores as on 31st December, 1981. The Company owns the following units under its operation:

A. **Mines**

1. Zawar Group of Mines (Rajasthan)
2. Maton Rockphosphate Mines (Rajasthan)
3. Agnigundala Lead Mines (Andhra Pradesh)
4. Rajpura Dariba Mines (Rajasthan), under development.
5. Sargipalli Lead Mines (Orissa), under development.
6. Rampura Agucha Deposits (Rajasthan) under exploration.
7. Baroi deposits (Rajasthan), under exploration.

B. **Smelters**

1. Zinc Smelter, Debari (Rajasthan)
2. Lead Smelter, Tundoo (Bihar)
3. Zinc and Lead Smelter Complex, Vishakhapatnam (Andhra Pradesh).

Gold. The Bharat Gold Mines Limited was incorporated in 1972 as a Public Sector Undertaking of the Govt. of India to own and manage the Kolar Gold Fields.

The authorised capital of the Company is Rs. 25 crores and paid up capital as on 31st March, 1981 was Rs. 21.65 crores.

The entire gold produced by the Company is taken over by the Government of India at International Monetary Fund (IMF) rate at Rs. 84.40 per 10 gms.

Production Statistics

Table 117

Aluminium

(Total Production — Public & Private Sectors)

Unit : Thousands Tonnes

Period	*EC*	*CG*	*Total*
A.			
(a) 1981-82 (Estimated)	105	110	215
(b) 1980-81 (Actual)	105	94	199
(i) Increase/decrease in (a) over (b)	..	(+)16	(+)16
(ii) Percentage of increase/decrease	..	(+)17%	(+)8%
B.			
(c) 1982-83 (Target)	130	130	260
(i) Increase/decrease in (c) over (a)	(+)25	(+)20	(+)45
(ii) Percentage of increase/decrease	(+)24%	(+)18%	(+)21%

Table 118

Copper

(Hindustan Copper Ltd.)

Unit: Tonnes

	Blister Copper	*Copper Cathodes*	*Wirebars*
1981–82 (Estimated)	30,000	28,330	21,700‡
1980–81 (Actual)	25,307	21,831	16,785
(i) Increase/decrease in (a) over (b)	(+)4693	(+)6499	(+)4915
(ii) Percentage of increase/decrease	(+)19%	(+)30%	(+)29%

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‡ Quantity depends on the sale of cathodes.

Table 119

Zinc & Lead

(Hindustan Zinc Ltd. & Cominco Binani Zinc Ltd.)

Unit: Tonnes

	Zinc			*Lead*
	HZL	*CBZL*	*Total*	*HZL*
1981–82 (Estimated) ..	50,000	12,000	62,000	13,700
1980–81 (Actual) ..	44,551	975†	45,526	14,925*

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† The Smelter of Cominco Binani Zinc Ltd. was strike-bound for a period of about 9 months.

* This does not include 301 tonnes of lead produced on toll basis out of Agnigundala Lead Concentrates.

Table 120

Gold

	(in Kg)
Bharat Gold Mines Ltd. (Union Govt. Concern) 1981-82 (Estimated)	1683
1980-81 (Actual)	1563
Hutti Gold Mines Company (State Govt. Company) 1981-82 (Estimated)	960
1980-81 (Actual)	783

122. INDUSTRIAL POLICY

Mixed Economy 1948. In the first flush of independence, India opted for a mixed economy. The industrial policy announced on 6th April 1948 envisaged an economy where public and private enterprises cooperated. The public sector reserved to itself monopoly rights in certain departments of industry like arms, atomic power, railway, transport etc. Other fields were left open for the private sector.

The Industries (Development and Regulation) Act, 1951 made it obligatory for all new and existing industries and any substantial expansion and manufacture of new products by existing concerns to be licensed under the Act.

Socialist Pattern 1956. In 1956 when the Congress Party decided to establish a socialistic pattern of society in India, the 1948 resolution was revised and a new policy was announced on April 30, 1956. Under this policy, industries were divided into two groups—Schedule A and Schedule B. The industries in Schedule A would be entirely state-owned; those in Schedule B would progressively become state-owned. Non-scheduled industries were left to the Private Sector, but public enterprises were free to enter this sector, if and when the Government so chose.

In 1970 the whole gamut of industrial policy was overhauled. The licensing policy was drastically revised in July 1970. The object of the revision was to give effect to the recommendations of the Industrial Licensing Policy Inquiry Committee (The Dutt Committee) and the Monopolies Inquiry Commission. The new licensing policy sought "to assign definite roles and areas of operation to different categories of entrepreneurs."

Industrial production was divided into the *core sector* (basic and strategic industries), the *middle sector* and *delicensed sector*. The middle sector was divided into two categories, the *heavy investment sector* (with a capital of 5 crores or more) and the *light investment sector* (capital between one crore and 5 crores). All industries requiring less than one crore investment were classified as delicensed.

The revised policy also introduced the concept of a *joint sector* in industry in accordance with the recommendations of the Dutt Committee. As a first step towards joint sector, all public lending institutions were required to convert their loans to private companies into equity shares (of the borrowing companies) so as to enable the government to have an effective voice in their management.

The primary object of the new policy was to do away with 'the concentration of economic power in the hands of a few' and therefore stringent restriction was placed on the expansion of big industrial houses. It sought to distribute the benefits of industrial development on a wider scale by giving favoured treatment to small and medium entrepreneurs. Accordingly, 128 items of production were reserved exclusively for them.

The Monopolies & Restrictive Trade Practices Act, 1969 was brought into force in June 1970. The Act placed a number of restrictions on big units with a total capital of 20 crores or over, in regard to appointments of directors, expansion of business and amalgamations or mergers.

The licensing policy was revised again in Feb. 1973. The revised policy set further restrictions on big houses, that is, any industrial house having assets of Rs. 20 crores or more. Small and medium entrepreneurs and cooperatives continued to be favoured. The joint sector idea was confirmed.

Streamlining Industrial Policy. On Nov. 1, 1973, the Ministry of Industrial Development streamlined the procedures for industrial licensing. It was decided that all applications will have to be disposed of within 90 days. Those that required clearance under the M. R. T. P. Act were to be disposed of in 150 days.

The new industrial policy was to be tailored to conform to the declared policy of the government for *growth with social justice*. Industrial progress has to comply with this socialistic imperative and see that the fruits of growth are distributed fairly and equitably. The government gave top priority to this question by encouraging small and medium investors to run feeder units of big industries and to take on new industries which cater to consumers directly.

The new policy laid great stress on the development of backward areas and the protection of the weak and vulnerable sections of society against exploitation by the capitalist class. With regard to backward areas a number of steps have already been announced to provide incentive for the location of industries in such areas. The new policy further increased the subsidy given to industries in backward areas. Similarly, the number of Letters Patent and Industrial Licences issued to backward areas were also progressively increased from year to year.

The weak and vulnerable sections of society have to be protected against a rise of prices beyond their capacity and from a shortage of supplies in essential commodities. This was to be taken care of by a public distribution system which provided food and clothing and other essential commodities at fixed prices to the common man. The scope and services of the public distribution system were enlarged to make it more efficient and effective.

Janata Industrial Policy, 1977. The Industrial Policy statement of the Janata government was laid on the tables of both Houses of Parliament on 23-12-1977. The

Janata policy was to be based on the agricultural economy. The statement says "The prosperity and the distribution of income arising from a broad-based growth of agriculture and related activities in the countryside have to provide the basic demand for a wide range of industries producing articles of consumption. It is only by such a process of reinforcing interaction of the agricultural and industrial sectors that employment can be found for the large numbers of the rural population who cannot be absorbed in the agricultural sector".

Small Scale Sector. Though the 1956 policy laid emphasis on the growth of the small scale sector, cottage industries and tiny industries of that type have been left unattended, all the attention being concentrated on the bigger units of the small scale sector. The new industrial policy has carved out a new sub-sector—the *Tiny Sector*—in the larger Small Scale sector. The units in the Tiny Sector have been identified as "those with investment in machinery and equipment up to Rs. 1 lakh and situated in towns with a population of less than 50,000 according to the 1971 census figures and villages".

Single Agency System. Industrial promotion has to be carried out by a single agency, instead of through the many-tiered, multi-agency system that had been adopted so far. The focal point of development for small and cottage units will be transferred from the big cities and state capitals to the district headquarters. In each district there will be one single agency to deal with all the requirements of small and village industries. This will be called the *District Industries Centre*.

The role of large scale industry will be related to the programme for meeting the basic minimum needs of the population through wider dispersal of small scale and village industries and strengthening of the agricultural sector.

Licensing Policy. "In its licensing policy, Government will regulate the activities of the large houses to bring them in line with the country's socio-economic goals". It will be the policy of Government to ensure that no unit or business group acquires a dominant or monopolistic position in the market.

Public Sector. "There will be an expanding role for the public sector in several fields. Not only will it be the producer of important and strategic goods of a basic nature, but it will also be used effectively as a stabilising force for maintaining essential supplies for the consumer. The public sector will be charged with the responsibility of encouraging the development of a wide range of ancillary industries, and contribute to the growth of decentralised production by making available its expertise in technology and management to small scale and cottage industry sectors. It will also be the endeavour of Government to operate public sector enterprises on profitable and efficient lines in order to ensure that investment in these industries pays an adequate return to society".

Balanced Regional Development. "The Government have decided that no more licences should be issued to new industrial units within certain limits of large metropolitan cities having a population of more than 1 million and urban areas with a population of more than 5 lakhs as per the 1971 census. State Governments and financial institutions will be requested to deny support to new industries in these areas such as those which do not require an industrial licence".

Congress (I) Policy, 1980. On 23rd July, 1980 the Minister of State for Industry made a statement in Parliament announcing the Industrial Policy of the Government.

The emphasis laid in the statement is on optimum utilisation of installed capacity and the expansion of industries as part of a wider strategy for revival of the industrial economy. The objective is to remove basic deficiencies and to provide for an integrated structure which would enable industry to advance on a broad front from the tiny sector to the large sector with each segment of industry inter-linked with its next segment so as to achieve the benefits of industrial development over a wide front, in terms of the basic approach to industrialisation laid down in the Industrial Policy Resolution of 1956. It also aims at higher employment generation, correction of regional imbalances, strengthening of the agricultural base, promotion of export-oriented and import substitution industries, promotion of economic federalism with an equitable spread of investments, consumer protection against high prices and bad quality. The increasing role of the public sector in the general strategy for revival of Indian industry has been re-emphasised. The private sector is also expected to play its assigned role within the framework of the socio-economic policy of the State and the relevent legislation enacted in this regard. Growth of monopolistic tendencies for concentration of economic power and wealth in a few hands is not to be permitted in consonance with the overall objectives.

In pursuance of this policy: (1) the government increased the investment limits for small scale industries and ancillary industries to Rs. 20 lakhs and Rs. 25 lakhs from Rs. 10 lakhs and Rs. 15 lakhs respectively with effect from August 1, 1980.

(2) Automatic growth rate of 5 per cent per annum (with a limit of 25 per cent) was allowed for 19 basic and core industries, in addition to 15 engineering industries which already enjoyed the facility of automatic growth from 1975.

(3) Established capacity in the 19 core industries and 15 other industries such as oil drilling, power transmission, railway safety and signalling equipment, etc. which were in excess of the licensed capacities, were regularised.

(4) The list of items reserved for exclusive production in the small scale sector has been reviewed and 27 more items have been added.

(5) Guidelines for establishing new sugar factories in the Sixth Plan were finalised.

(6) According to the policy announced in April 1978, establishment of new units or expansion of existing units in metropolitan cities with a population of 10 lakhs or more within the municipal limits of cities with a population of 5 lakhs or more was prohibited. Certain relaxations from this policy were announced in August, 1979. The locational policy has been reviewed so as to achieve the twin objective of optimum utilisation of installed capacity and preservation of the environment and ecological balance in the country. New guidelines to relax the location policy were announced on 20th November, 1980.

1981-82. The Industrial Licensing Policy of the Government continued to be in line with the Industrial Policy Resolution of 1956 and the Statement on Industrial Policy of 23rd July, 1980. The main thrust of the policy continued to be in the direction of achieving the socio-economic objectives, namely, (i) optimum utilisation of installed capacity, (ii) maximum production and achieving higher productivity, (iii) higher employment generation, (iv) correction of regional imbalances, (v) promotion of export-oriented industries, (vi) promotion of economic federalism through equitable spread of investment and dispersal of returns and (vii) consumer protection against high prices and bad quality.

Important elements in the new policy are: (1) Relaxation of the provision for location of industries on a selective basis, so as to provide for natural growth, export generation etc. (2) Setting up nucleus plants in industrially backward areas and hundred percent export-oriented industries wherever feasible and (3) De-reserving 13 items from the Small Scale list enabling bigger units to take up their production but at the same time adding another 12 items to the Small Scale Reserved List.

Industrial Licenses. The Secretariat for Industrial Approvals was set up in November, 1973 as a unified agency for processing applications for industrial licences, foreign collaborations and import of capital goods. As a result of special efforts, there has been a substantial improvement in the overall disposal of applications as well as in the issue of letters of intent and industrial licences. During the year 1981, 1885 industrial licence applications were disposed of and 916 letters of intent and 476 industrial licences were issued.

123. INDUSTRIAL DEVELOPMENT

Birth of Modern Industry. The British occupation of India had progressively destroyed Indian industries in metallurgy, textiles, handicrafts, chemicals, pharmaceuticals etc. No doubt, the Indian industries which disappeared were the village industries of the ancient type that depended on traditional skills and inherited technology. The credit for modernising Indian industry goes to the Britishers, though not to the British administration in India.

The year 1850 may be regarded as the watershed, which marked India's entry into modern industry. Pioneer attempts at starting various industries were, however, made earlier. These pioneers were mostly Europeans. The first iron-smelter was established in Madras in 1815, the first cotton mill near Calcutta in 1818 and the first coal mine at Raniganj in 1820. The first coffee plantation was opened in 1823. Pioneers continued to come forward even after 1850. Jute industry, already a well established cottage industry, was modernised by British entrepreneurs in 1854. The first rubber plantation in India was opened in Kerala in 1900—again by Britishers. The first cement plant was set up in Madras in 1904.

None of these first attempts survived long. A second generation of pioneers, almost all of them Indians, laid the foundations of modern industry in India. Among these pioneering ventures were Bombay Spinning and Weaving Company (1854), Bengal Iron Works (1854), Rally (Paper) Mills (1870), and Tata Iron and Steel (1907). Industrial growth, however, was slow. By the end of the First World War, India had only a handful of industries—coal, cotton, textiles, jute, cement, paper, iron and steel, coffee and tea. Production was moderate and limited, even nominal in many cases.

Post-War Growth. After the First World War, British administration paid more attention to Indian industries. The policy of protection, started in 1922, gave a fillip to industrial growth. As a result many new industries came up and the industrial structure expanded considerably. From 1925 to 1946, consumer industries predominated in India.

By 1950 India had some well established industries. These included textiles, jute goods, sugar, tea, vanaspathi (hydrogenated vegetable oils), soap, footwear, paper and paper boards, plywood, cement, salt, glass, industrial alcohol, matches, iron and steel.

Planned Development. Since 1951 when the First Plan began, India not only expanded its capacities in all the industries already existing in 1950 but also made good beginnings in a host of other fields like heavy engineering, plant and machinery, drugs and pharmaceuticals, electrical equipment and farm inputs such as tractors, fertilisers and pesticides.

By 1965-66, when the Third Plan ended, the proportion between consumer goods and capital goods, changed radically. Consumer goods declined from 68 per cent in 1950-51 to 34 per cent in 1965-66, while the production of capital goods increased from a mere 8 per cent in 1950-51 to 22 per cent in 1965-66.

Overall growth 1950-65. The growth of Indian industry, though commendable, was not commensurate with its potentialities. The maximum annual growth rate registered by the Indian industrial economy was about nine per cent in the early sixties. This is quite insignificant, when we consider that other developing countries much smaller than India and less advantageously placed, like Taiwan, Israel and Thailand, have shown an average growth rate around fifteen per cent.

The decade 1965—1975 was marked by ups and downs and various tortuous turns in the industrial economy. The outstanding feature of the decade was a wholesale programme of nationalisation. The nationalisation programme which started with the bank nationalisation in 1969 was followed by the nationalisation of general insurance. In industry, as such, it started with the nationalisation of the foreign-owned Indian Copper Corporation in March 1972. The Indian Iron and Steel Company came next in July 1972. The Coking Coal mines (214 of them) were taken over in Aug. 1972 and Non-Coking Coal mines (464 in number) in Jan. 1973.

1974—75. In 1974 industrial production suffered from all the agonies of a runaway inflation. Between Dec. 1973 and Dec. 1974 the Wholesale Consumers Price Index rose by as much as 25.4 per cent. The Government boldly stepped forth to bridle inflation and contain prices.

A national emergency was proclaimed. A number of auxiliary measures—all of them unpopular—were promulgated. These included compulsory deposit of additional emoluments, control on the disbursement of dividends, and severe restrictions on money supply and credit. The 20-point programme which followed helped to put the economy back in order.

1975—78. In 1975-76 industrial production falling within the purview of the Director General of Technical Development (DG TD)* increased by 17 per cent in monetary terms and by 11.5 per cent in real terms.

This growth rate has been attributed to the policy of import substitution which the government has been following for some years. A large number of new Capital Goods is being added to the production line every year.

Industrial Sickness. Industrial sickness had for some years been a sickening feature of the industrial economy. At first it was treated as an aberration of the textile industry and the National Textile Corporation (NTC) had been formed to take over the sick textile units. But the sickness had extended to other industries as well. In

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* The Directorate General of Technical Development (DGTD) is the technical advisory organisation to the Ministry of Industry, other Ministries and Departments of Government, the Planning Commission and various branches of industry in all technical and regulatory aspects of industrial development. Over the years, the emphasis has been gradually shifting from regulatory to the technological and developmental aspects.

Dec. 1977 the number of large and medium-sized sick units, that is, units that enjoyed aggregate bank credit of one crore (Rupees) and above, numbered 269 as against 241 units in Dec. 1976. Engineering, electricals and iron and steel industries were the worst affected.

The sick list is increasing. In 1979, the government had taken over 20 sick units engaged in various industries, 16 of which were registered in Calcutta. In 1980, 4 other units were added.

In 1980-81, 13 sick units already taken over were nationalised. They included some well known firms like Hind Cycles, Bombay, Sen-Raleigh, Calcutta and Bengal Chemical and Pharmaceutical Works.

Development of Backward Areas. The development of backward areas has been the accepted national policy derived from the Industry Policy Resolution of 1956. But for many years it had remained just an idea. From 1971 onwards special attention was paid to attract industries to the backward regions of the country. For this purpose 246 districts all over India were declared backward and special incentives were offered to entrepreneurs to start industries in these areas. One of such incentives was an outright subsidy of 15 per cent on fixed capital investments like land, machinery etc. (see S. 136).

Although many industries have been started in backward districts they have not been of any magnitude to be treated as a national phenomenon. The backward districts continue to remain backward in spite of the new industries.

1980-81. The policy statement of July 1980 marks a turning point in industrial history. The cornerstone of this policy is the optimum utilisation of installed capacity and the expansion of industries as part of a wider strategy for the revival of the industrial economy. The objectives of the policy include higher employment generation, correction of regional imbalances, faster promotion of export-oriented industries as well as self-reliance through deliberate and systematic import substitution, development of agro-based industries and equitable opportunities for investment and dispersal of small and growing units in rural as well as urban areas.

Convertibility Clause. One of the underlying reasons for industrial stagnation is the so-called convertibility clause, the brain child of the Dutt Committee. (see S. 122, para 6). This clause entitles all public lending institutions to convert their loans into the equity shares of the company they finance. The company concerned has no voice or choice in the matter.

This clause has generated widely varying reactions—all of them, escape strategies. Many companies refused to touch this 'poison pawn'. Many exploited the clause to turn sick‡. Many preferred to give up projects of modernisation or expansion rather than go to the public lending agencies. Many more sought loans from the public, including their own shareholders. The total result was this provision adversely affected investment in and expansion of industries as a whole.

J. N. Saxena, Chairman of the IDBI, in his annual statement (1979) admitted "Despite all clarifications given as well as assurance that this clause (convertibility clause) is neither intended for a backdoor nationalisation nor as an instrument to wrest management control....the clause continues to act as a damper to investment".

The Indian Financial Corporation has decided (Oct. 1980) to waive this clause for all loans for modernisation in any industry or for rehabilitation of sick units.

New Companies. In October 1980 the government acquired the undertakings of Maruti Ltd, by an Ordinance, later replaced by an Act. Its object was to utilise the infra-structural facilities and assets of the company to modernise automobile industry. A new government company, Maruti Udyog Ltd., has taken over the assets of Maruti Ltd. Another company was also taken over in 1980, namely, Bird & Co Ltd. who manufactures water treatment plants, chemical equipment and EOT cranes. The company has been renamed Bharat Process and Mechanical Engineers Ltd.

1981—82

Import Substitution. The policy of import substitution has paid rich dividends over the years leading to increased production. The step-up in production accounts for, besides increase in items already manufactured in the country, the manufacture of several new items produced in the country for the first time.

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‡ The Economic Survey of 1981 called for a review of the policy on industrial sickness so that the government and financial institutions are not saddled with a "miscellany of intrinsically unviable industrial units, and with a view to dispel the impression that unscrupulous managements can act with impunity in the hope that they would invariably be baled out of trouble for one reason or the other".

Nucleus Plant Programme. In line with the Industrial Policy Resolution of 1980, sixty-one districts and areas have so far been identified by 21 State Governments for launching the nucleus plant programme.

In order to get a quick assessment of the type of projects required in each district or area, their ancillary linkage and infrastructural needs, 24 task forces have been set up.

Backward Area Development: Government has launched a special programme of subsidies and fiscal incentives so as to attract investment in the hitherto undeveloped backward areas. For this purpose, 246 districts have been declared as industrially backward. Certain special facilities and incentives in the form of concessional finance, relief in income tax etc. are also being provided. Out of these 246 districts, 101 districts were further identified in which industries are eligible for the investment subsidy as an outright grant at the rate of 15 per cent on fixed capital such as land, building, plant and machinery. The maximum amount of subsidy payable to an industrial unit is restricted to Rs. 15 lakhs.

124. PUBLIC SECTOR

Constituents of the Public Sector. The Public Sector is an omnibus term which comprises all economic enterprises owned or operated by the Government. Among them are departmental undertakings like the Railways, Statutory Corporations like the Damodar Valley Corporation, financing institutions like the Film Finance Corporation, public utility undertakings like Transport and Electricity and public limited companies incorporated under the Indian Companies Act.

State Entry. Before independence, private companies controlled the overwhelming majority of industrial and commercial undertakings in the country. The significant exception was the Railway. These private firms were mostly promoted and controlled by *Managing Agents*. The Managing Agency System (as it was known) was mainly responsible for the postwar development of Indian industry and commerce.

With independence, the State came into the picture. The 1948 resolution on economic policy envisaged a mixed economy in which both the public sector and the private sector co-existed. But with the 1956 resolution on economic policy, the State emerged as the leader of national economy.

Objects of the Public Sector. According to the Bureau of Public Enterprises, the primary objects of the public sector are to (i) give an adequate return on investments (ii) capture commanding heights of the economy (iii) share the burden in industrialisation (iv) generate additional employment (v) promote balanced regional development and (vi) develop ancillary and small scale industries.

Evolution of the Public Sector. "The initial thrust" as Dr. Krishnaswamy says "for enlargement of the public sector came from both pragmatic and ideological considerations. In the fifties there was an acute appreciation of the one-sidedness of the Indian economy and of the urgency of accelerated industrialisation. Even here, the emphasis was on basic capital goods industries—steel, heavy machinery and machine tools, fertilisers, oil refining etc. rather than on consumer goods industries." In outlining the policy of industrialisation, "there has undoubtedly been an element of idealism, if not ideology, in the initial years of planning. While capital accumulation and growth were assiduously sought, much stress was laid on ensuring that, in the process, concentration of wealth and economic power in private hands was avoided. The early planners, especially Jawaharlal Nehru, saw in the public sector a means of reconciling economic development with distributive justice."*

Over the years, these ideas "have influenced significantly the location of public enterprises, industrial policy in general, policy governing administration or control of prices, labour legislation and import and foreign investment policies . . . Likewise reservation of additional investment to the public sector in certain areas derived from the desire to occupy commanding positions in the relative markets. The more recent developments of nationalisation of banks, canalisation of imports, takeover of insurance companies, all are evidences of this intention. Concern with employment has been the motive force in the increasing tendency on the part of the government to take over sick units. In all of these the deciding factors have often been extra economic†"

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* Dr. K.S. Krishnaswamy, Ajit Bagat Memorial Lecture, Ahmedabad, Dec 1980 † *Ibid.*

Size of the Public Sector. The public sector dominates the industrial scene in all sectors, primary, secondary and tertiary. At the end of March 1979, the Central Government alone had an investment of over Rs. 15,600 cr. in 179 undertakings. This refers to the number of registered establishments, and do not include the subsidiary concerns which many undertakings have.

If one were to add to these the concerns under the control of State and local governments, the number of establishments in the public sector (including State Electricity Boards) exceeds 600, with investment of the order of Rs. 25,000 crores. These undertakings function all over the country, and excluding railways, posts & telegraphs, other departmental undertakings and banks, the Central Government undertakings alone employed, as at the end of March 1979, nearly 1.9 million people. If State and local government establishments, nationalised banks, railways etc. were added, the labour employed would be in the neighbourhood of 4.0 million.

Profitability. For the 159 running enterprises of the Government of India (excluding insurance companies and banks), total gross profits before tax (including interest) amounted in 1978—79 toRs. 1076 crores. After payment of interest and taxes, however, this turned into a net loss of Rs. 32 crores. Of the enterprises, 88 actually earned a net profit of Rs. 485 crores. But these were more than offset by the net loss of Rs. 517 crores incurred by 69 enterprises. Nearly Rs. 212 crores of this loss was suffered by Coal India Ltd., with Shipping Corporation (Rs. 44 crores), Indian Iron &Steel and Heavy Engineering Oorporation (Rs. 27 crores each) and Hindustan Fertilizer Corporation (Rs. 22 crores) contributing the bulk of the remainder. On total capital employed (net fixd assets plus working capital) ofRs. 14,175 crores, the gross profit and interest of Rs. 1076 crores constituted a return of 7.6 per cent. This had, of course, increased from 2.8 per cent in 1968—69; but this increase was largely a reflection of the growth in interest on capital employed.

The Core of the Public Sector may be said to consist of 18 concerns under the Department of Heavy Industry, in the Ministry of Industry. These have an investment of about Rs. 1150 crores and employ about 1.75 lakh people. Their turnover increased by 10 per cent to Rs. 1302 crores in 1980—81 against Rs. 1189 crores in the previous year. As a result of a concerted drive by the Government, backed by improved infrastructure support, the performance of public sector units had started improving since October 1980. This has gained further momentum during the current year 1981—82. During April to December, 1981, the public sector undertakings have achieved a production of Rs. 1028 crores which is 25 per cent higher than the production of 824 crores achieved during the corresponding period last year. In addition, Engineering Projects (India) Ltd., a consultancv-cum-contracting organisation has achieved a turnover of Rs. 129 crores during April-December, 1981 which is 17 per cent higher than the turnover achieved in the corresponding period last year.

In view of the all round improvement in the industrial environment and particularly in infrastructure industries, the public sector undertakings of this Department are expected to achieve their target of production of Rs. 1600 crores for the year 1981—82 which would mean a growth of 24 per cent compared to the production achieved in 1980—81.

Box 50
Industrial giants

While 27 public sector companies have assets over Rs. 200 crores, their counterparts in the private sector number only 6.

The six private corporate sector companies figuring in the top 33 giant corporate units in the country (assets of Rs. 200 crores or more) are: (1) Associated Cement; (2) Gujarat Narmada Valley Fert., (3) Industrial Credit & Invest. Corpn., (4) Tata Engg. & Locomotive, (5) Tata Iron & Steel, and (6) Scindia Steam Navigation.

The list of twenty-seven public sector companies includes: Coal India, National Textile Corpn., Shipping Corpn. of India, Indian Iron & Steel and Hind. Petroleum Corpn. which were originally belonging to the private corporate sector, — some of them existed as separate and small units prior to their nationalisation and take over.

With the improvement in production, the trend of rising aggregate losses has been arrested substantially and these are expected to be halved from Rs. 61.56

crores in 1980–81 to Rs. 31.93 crores in 1981–82. During 1982–83, these undertakings have projected an aggregate profit of Rs. 24.27 crores.

Table 121

Production of Public Sector Undertakings

Name of Unit*	1977-78	1980-81	% of growth over 1979-80
BHEL	522.02	787.54	12
BHPV	25.46	34.49	10
BPCL	12.44	12.25	(−)34
BBVL	1.74	3.57	34
BWEL	2.08	4.81	24
Braithwaite	16.48	15.62	28
Burn Standard	29.14	49.21	31
HEC	42.15	64.33	4
HMT	119.71	187.40	3
Jessop	45.05	37.70	15
MAMC	9.46	31.56	—
R&C	10.13	19.45	(−)7
SIL	10.32	29.49	17
TSL	9.87	12.05	(−)5
TSP	5.79	7.11	11
Lagan Jute	. . .	4.54	66
BPMEL	. . .	1.08	. .
Maruti Udyog	Production yet to be taken up		
TOTAL	861.84	1302.20	10

* Full names & details given below.

BHEL Bharat Heavy Electricals Ltd.

BHPV Bharat Heavy Plate & Vessels Ltd.

BPCL Bharat Pumps & Compressors Ltd.

BBVL Bharat Brakes & Valves Ltd.—by the takeover of Gresham & Craven of India (Private) Ltd. in 1978.

BWEL Bharat Wagon & Engineering Company Ltd.—by the takeover Britannia Engineering Company and Arthur Butler & Co, 1978.

Braithwaite: Braithwaite & Company Ltd.—by the takeover of Braithwaite & Co. India Ltd, initially in 1971.

Burn Standard: Burn Standard Co. Ltd.—by the takeover of Burn and Company Ltd. and Indian Standard Wagon Co. Ltd. initially in 1973.

HEC Heavy Engineering Corporation Ltd. Ranchi.

HMT Hindustan Machine Tools Ltd. (formed 1953).

Jessop Jessop and Company Ltd. Calcutta—by the takeover of Jessop & Co. Ltd.

MAMC Mining & Allied Machinery Corporation Ltd.

R&C Richardson & Cruddas Ltd. Bombay by the takeover of Richardson & Cruddas Ltd. Bombay.

SIL Scooters India Ltd. (formed 1972).

TSL Triveni Structurals Ltd. (1965) a joint enterprise by the Govt. of India and A.P. and Karnataka govts.

TSP Tungabhadra Steel Products Ltd. (Karnataka)—a joint enterprise with Voest Alpine of Austria.

Lagan Jute: Lagan Jute Machinery Co. Ltd.—by the acquisition of a foreign concern, James Mackie Holdings Ltd. Belfast.

BPMEL Bharat Process and Mechanical Engineers Ltd.—by the acquisition of Bird & Co Ltd (excluding Weighbird).

Maruti Udyog: by the acquisition of Maruti Ltd.

125. PRIVATE SECTOR

The Corporate Sector. Business houses engaged in industry, trade or other activities fall into four groups according to their legal status. 1. Joint-stock companies, 2. Partnership, 3. Co-operatives and 4. Statutory organisations. Joint-stock companies are companies with limited liability which are registered under the Indian Companies Act and are governed by it. Partnerships are firms with unlimited liabilities and are regulated by the Partnership Act. Co-operatives function under the Co-operative Society Acts. Statutory organisations are governed by the specific Acts under which they are formed. The nationalised banks, for example, are now statutory organisations governed by The Banking Companies (Acquisition and Transfer of Undertaking) Act 1970. Before nationalisation, they were joint-stock banks and bore the suffix 'limited'. This suffix has disappeared with nationalisation because they are no longer governed by the Indian Companies Act.

Of the four groups mentioned above, joint-stock companies form by far the largest group. This group is collectively called the *Corporate sector* because all of them are companies incorporated under the Companies Act. The corporate sector covers both private and public sectors. That is to say, it contains all the joint-stock companies in the private sector and such public sector companies as are incorporated under the Companies Act. As between public and private sector companies, the main difference is that the public sector companies are, as a rule, gigantic while private sector companies are puny in size, though much greater in numbers. (see Box 50)

The Companies Act. The Indian Companies Act 1913, a piece of pre-war legislation, was thoroughly overhauled after independence and replaced by the Companies Act 1956. There have been many amendments since. These amendments have altered the very face of the Act.

One of the most important amendments was the Companies (Amendment) Act 1969. It abolished the system of Managing Agency/Secretary and Treasurer with effect from April 3, 1970. The amendment also prohibited corporate companies from making donations to political parties.

The next important amendment was the Companies (Amendment) Act 1972. This brought in many changes of a drastic nature. One crucial amendment classifies companies with a paid up capital of Rs. 25 lakhs or more or with a turnover of Rs. 50 lakhs and above as public companies. Once such companies are declared public companies they cannot borrow or invest or appoint a managing director or full-time director or a selling or purchasing agent or any person holding a salary of more than Rs. 3000 without the permission of the Central Government. Under another amendment (Section 408) the Central Government has reserved to itself the right to appoint any number of directors to the Board which means that the shareholders have no powers left to elect their own directors and run their business.

Amendments to Sections 17, 18, 19, 79, and 141 remove the jurisdiction of the courts and make the Government of India the supreme authority in all matters covered by the original sections.

Penalties for breach of the provisions of the Companies Act have been made so rigorous that the amended Act would read like an abridged edition of the Indian Penal Code.

In effect, therefore, the amended Companies Act, converts all big private companies into a virtual department of the Government of India. In future, only small and medium sized companies, that is, those companies with a paid up capital of less than Rs. 25 lakhs and a turnover of less than Rs. 50 lakhs, will remain in the so-called private sector.

Under the Companies (Amendment) Act 1974, the powers of the High Courts over corporate companies (which were transferred to the Govt. of India under the 1972 amendment), were now statutorily vested in the Company Law Board.

The Companies Amendment Act of 1977 amended S. 58A, S. 293, S. 220 and S. 620 and introduced a new section 634A. The important changes brought in by the Amendment are: 1. It authorised the Central govt. to grant exemption to companies from the operation of S. 58A which restricts acceptance of deposits from the public. S. 58A, it may be noted, was added by an amendment in 1974 with the specific purpose of safeguarding the interests of a large number of the public who had deposited their life's savings with companies who offered high rates of interest for deposits. 2. It empowered the company in General Meeting to donate up to Rs. 50,000 for charitable purposes or for the welfare of its employees. 3. It empowered the Company Law Board to enforce some of its orders as a decree of a court of law.

The Company Law Board. This Board was constituted under Section 10 E of the Companies Act 1956. The Central Government has delegated its powers and functions under S. 294 AA to the Company Law Board by a notification d. 24th June, 1975. Now that the powers of the Govt. under Ss. 2 (18 A), 17, 18, 19, 79, 141 and 186 of the Companies Act have been statutorily vested in the Board, it has acquired complete authority and jurisdiction over all private sector companies. The fact that the Secretary to the Dept. of Company Affairs is also the Chairman of the Board makes it a full-fledged Dept. of the Government of India.

Public & Private Sector Companies. As most of the public sector companies and all of the private sector companies are registered under the Companies Act, they are quite similar in structure and working. One point of difference may, however, be noticed. While public sector companies suffer little or no casualties, private sector companies show a very high rate of mortality. Thus, in 1978–79 while no government company ceased to work, 383 private companies did. In 1979–80 only 3 government companies ceased work as against 254 in the private sector.

Companies at Work. As on 30th September, 1981, 66,632 companies limited by shares with an aggregate paid-up capital of Rs. 15254.8 crores were at work in the various States and Union Territories of India. These companies comprised 867 Government companies and 65,765 non-Government companies with a paid-up capital of Rs. 11261.6 crores and Rs. 3993.2 crores respectively. Of the companies at work, the great bulk consisted of private limited companies (Table 122).

New Registrations. During the year 1980–81, 6616 new companies limited by shares having an authorised capital of Rs. 968.3 crores were registered in India under the Companies Act, 1956. Of these, 38 were Government Companies and 6578 were non-Government companies with an authorised capital of Rs. 351.6 crores and Rs. 616.7 crores respectively. During this period, 98 non-Government companies with unlimited liability and 40 non-Government companies with liability limited by guarantee were also registered.

Table 122

Companies at work as on 30-9-1981

	Public Sector (Govt.)		Private Sector (non-Govt.)	
	No. of Cos.	Paid-up capital (Rs. in crores)	No. of Cos.	Paid-up capital. (Rs. in crores)
Public Ltd. Companies	360	1112.5	9154	2977.4
Private Ltd. Companies	507	10149.1	56611	1015.8
	867	11261.6	65765	3993.2

126. SMALL SCALE SECTOR

The small scale sector comprises a wide range of small and medium industries.

Samll industries are identified by different criteria in different countries. In India small industries were originally defined as industrial units with a capital of not more than Rs. 5 lakhs, irrespective of the number of persons employed. In 1975–76 the maximum capital capacity of a *small industry* was raised to Rs. 10 lakhs and in the case of *ancillaries* to Rs. 15 lakhs. In 1980, it was further raised to Rs. 20 lakhs for small units and Rs. 25 lakhs for ancillaries.

Tiny Sector. In 1977 the Janata government carved out a new sub-sector in small scale industries called the *Tiny Sector.* This sector covered the smallest of the small industries, otherwise known as cottage industries. The maximum investment in this sector is Rs. 2 lakhs.

Traditional Industries. India has been famous for its industries from very ancient times. Even in the days of the Indus Valley Civilization, some six thousand years ago, India had kept up a brisk trade with Sumar, Elam, Ur, Kish and the other advanced countries of the times, in metals, precious stones and other articles. In the mediaeval age, 'the wealth of Ind' had become proverbial in far off countries and "the magnificence of the Court of the Great Mogul had dazzled even eyes which were accustomed to the pomp of Versailles".

Indian artfacts of various kinds filled the markets of the West—gleaming brassware, embroidered shawls, iridescent silks, perfumes, pottery, gold-laced cloth, leather fabrics, gems and gem-studded ornaments. Textiles excelled. Indian cotton and silk textiles by their sheer elegance and utility have continued even to this day, as fabrics of renown. Names of fabrics, like 'Chintz', 'Calico' and 'Khaki' are Indian words that have been anglicised. 'Chintz' is derived from 'chita', a Dravidian word meaning spotted cloth. The best 'chintz' were made in Golconda, T. Nadu and Gujarat. 'Calico' is plainly reminiscent of Calicut, a town on the west coast of India. 'Khaki' similarly was pioneered by the veteran weavers of the west coast..

With the advent of the British, things cahnged. The British deliberately set out to destroy the traditional industries. India ceased to be a producer of finished goods and became, instead, a supplier of raw materials to British industry. Western machine-made goods replaced Indian handicrafts. The spread of railway transport and emergence of large-scale industry in India accelerated the decline of Indian cottage industries.

When India became free, it was decided to salvage this priceless heritage from the junk-heap of history. Fortunately the inherited talents of centuries lay dormant in the nooks and corners of rural India and workers skilled in practically all fields of production from weaving to metallurgy could be found all over India. The mission of the small-scale sector is to organise these talents and re-orient them to suit modern conditions.

Role of Small Industries. The role of small industries in national development is by no means small. Even in highly industrialised countries where mas production is the rule many small units exist and thrive as ancillaries to large units in sophisticated production lines. In the Federal Republic of Germany small units employ 27 per cent of the total industrial labour force. In USA the percentage is 65 and in Japan 83.

In India small industries are assigned a distinctive role in the developmental process. The Industrial Policy resolution of 1956 says "Government of India . . . stress the role of cottage, village and small scale industries in the development of the national economy. They provide immediate large scale employment; they offer a method of ensuring a more equitable distribution of the national income; and they facilitate an effective mobilisation of resources of capital and skill which might otherwise remain unutilised".

The economic strategy behind encouraging the growth of small scale industries is that they provide more employment per unit of capital employed, facilitate dispersal of industries, help in reducing inequalities in income, and provide consumer goods without a long gestation period.

Small industries have a favoured status in the national economy. They can produce any type of goods, however sophisticated, within their capital capacity. Certain items have been set apart for the small scale sector and large units have been specifically barred from producing those goods.

The number of such reserved items have steadily increased, bringing them up to 807 in 1978. In 1981, another 27 items were added making 834 items in all.†

Industrial Estates are another scheme specially designed for small industries. In March 1979—the latest date on which figures on industrial estates are available—there were 796 industrial estates in the country housing 18,421 small units. These provided direct employment to over 28 lakhs of persons and produced goods worth over Rs. 800 crores.

Growth of SSI. The growth of small industries in India during the plan periods has been described as "nothing short of a revolution".

The small scale sector, which started with the manufacture of simple items like buckets, trunks, rails, agricultural implements, etc., with the help of simple hand tools, has now entered many sophisticated fields like electronics, plastics, chemicals, precision instruments etc.

Production & Export. The estimated value of production during 1980–81 at current prices is above Rs. 28,000 crores as compared to Rs. 19,000 crores in 1979–80 and estimate of employment will be about 71 lakhs against 64.6 lakhs in 1979–80. Exports from SSI Sector are estimated to have gone up from Rs. 1050 crores in 1979–80 to Rs. 1305 crores approximately in 1980–81, accounting for a rate of growth of 8.9 per cent in production, 6 per cent in employment generation, and 4 per cent in exports.

District Industries Centre. In pursuance of the statement on Industrial Policy announced in the Parliament in July, 1980, certain modifications have been carried out in order to restructure the District Industries Centres. The restructured DIC would have, besides one General Manager and four Functional Managers, upto three Project Managers in technical disciplines considered relevant to development of projects.

The present pattern of sharing the expenditure on the DICs between the Centre and the States on 50 : 50 basis would continue.

According to reports received from 324 DICs during 1980–81, 237,564 new units comprising 1,77,236 artisan-based and 60,328 small scale units were established. These units provided employment opportunities to over 8.07 lakh persons. The credit assistance provided by financial institutions amounted to Rs. 286.80 crores. On an average per DIC, during the period from April, 1980 to March, 1981, 733 units have been established generating additional employment opportunities for 2491 persons. Credit assistance provided by financial institutions amounted to Rs. 0.89 crore per DIC.

Industrial Co-operatives. Industrial co-operatives have been assigned an important place in the scheme of economic development. The Industrial Policy of the Government also lays special emphasis on the development of village and small industries in order to generate more employment opportunities in the rural areas. Industrial cooperatives are expected to play an important role in the successful implementation of the policy.

Handlooms. Handloom weaving is one of those traditional village industries that have held their own against modern mechanised industries. According to S. Banerjee* handlooms provide direct employment to more than a crore of people and indirect employment to another half a crore. Completely neglected under the British raj, this long established village industry was paid special attention to by independent India. As a first step towards the regeneration of the industry, the *All India Handloom Board* was formed in 1952.

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† In 1982 some items were de-reserved, and some new items added to the reserved list.

* President, All India Handloom Fabrics Marketing Co-op. Society.

Since co-op. societies enjoyed certain privileges most handloom units were converted into co-op. societies, who thus enjoyed facilities of co-op. finance and marketing. In addition, 18 textile items were set apart for the handloom weavers and mills in the organised sector were barred from producing such varieties.

Handloom is a cottage industry in every sense of the term as the work is done largely in the home of the weaver himself. There are over 3.5 million handlooms in the country providing direct employment to nearly 10 million people.

The handloom sector produced over 3,100 million metres of cotton textiles during 1980—81. This is more than 30 per cent of the cotton textiles produced in the country. A rough estimate indicates that the production in 1981—82 was more than 3,700 million metres.

Handicrafts. Handicrafts industry in India, besides helping to solve both social and economic problems of the village craftsmen and the vulnerable sections of the society, has come to play an important role in earning valuable foreign exchange for the country. During 1979—80 handicrafts ranked as the third largest foreign exchange earner after agriculture and allied products and textiles. Exports registered more than ten-fold increase during the last ten years from Rs. 80 crores in 1970—71 to Rs. 854 crores in 1979—80

The industry is highly labour-oriented and currently provides employment to about two million craftsmen and their dependents numbering another five million. Dispersed all over the country, the industry is traditionally confined to the decentralised sector. Uttar Pradesh accounts for more than 60 per cent of India's production and exports of the major handicrafts (excluding gems & jewellery) namely handknitted woollen carpets, art-metalwares, hand-printed textiles and wood wares.

Reliable statistics relating to production of handicrafts in India are not available. Based on the current level of exports the production of handicrafts (excluding gems & jewellery) is estimated around Rs. 400 crores. The exports, which by and large accounted for about 80 per cent of the annual production, registered spectacular growth (more than 800 per cent) during the seventies from Rs. 37.5 crores in 1970—71 to Rs. 314 crores 1979—80.

KVIC. The Khadi & Village Industries Commission is one of the main instruments for rural industrialization. Set up under an Act of Parliament in the year 1957, it is responsible for planning, organizing and implementing programmes for the development of khadi and 25 specified village industries. Its programmes are implemented through 25 State Khadi and Village Industries Boards, about 800 registered institutions and 29,000 cooperatives. The activities of the Commission, at the moment, cover about a lakh of villages in the country.

The overall production of khadi and village industries during the year 1980—81 is expected to be of an order of Rs. 558.09 crores as compared to Rs. 440.01 crores in 1979—80, registering an increase of 27 per cent of the total output, the share of khadi would be Rs. 106.85 crores and that of village industries Rs. 451.24 crores. In terms of quantity, the output of khadi is expected to increase from 822.74 lakh sq. meters in 1979—80 to 910.09 sq. meters in the year 1980—81. Employment would have been provided to 30.16 lakh persons in the year 1980—81 as compared to 27.33 lakh persons in the previous year. Total earnings of khadi and village industries artisans went up from Rs. 122.09 crores in the year 1979—80 to around Rs. 151 crores in the year 1980—81.

The Coir Board, a statutory body established by the Central Government, continued its activities of promotion and development of the coir industry during the year under review. It undertook the export of coir and coir goods, research for product betterment, modernisation of manufacturing techniques, fixing grade and standards and arranging inspection of coir goods and generally improving their marketing both within and outside the country.

Coir exports during the year 1977—78 were of the order of Rs. 23.86 crores as against Rs. 22.77 crores in 1976—77. There was, however, quantity-wise decline in export, i.e., 42,196 tonnes in 1977—78 against 44,357 tonnes in 1976—77. During the first 6 months of April—September 1978, the exports were 19,225 tonnes valued at Rs. 11.50 crores, which is an improvement over the exports in the corresponding period of the previous year.

127. LAND POLICY

Land had always been a socio-economic problem in India. Socially it was a status symbol, economically the bread basket. However, its social significance far outweighed its economic value. The consequence was that every member of the family demanded a share in the family property. Big landed estates were thus progressively cut down into small holdings. These small holdings were again fragmented till they became utterly uneconomic and a burden to their owners. These petty owners were at last compelled to sell out their fragmentary holdings to the rich farmers or, more often, to the money lenders. The rich landlords and money lenders thus acquired vast estates most of which were made up of scattered and fragmentary holdings. They rented out these fragmentary holdings to petty landholders or landless workers and a whole new class of petty tenants and sharecroppers came into being. These marginal and sub-marginal farmers cultivated their petty holdings under various tenurial arrangements which differed from place to place.

The agricultural class or those who depended mainly on land for their living, fell into two broad categories—the title-holders and the actual cultivators. In between these two, there arose a third class who neither possessed any title to nor carried on any cultivation on land. They merely functioned as the link between the landlords at one end and the cultivators at the other. They squeezed the poor cultivators by levying high rentals and at the same time chiselled the landlords of their legitimate dues. They thus became the most important as well as the most ruinous class in the agricultural economy. It was necessary to eliminate this parasitic class if a healthy agricultural economy was to be evolved. Land reforms thus became not only necessary but urgent and unavoidable

Land Reforms. The Planning Commission has laid down the basic principles of land reforms as follows: (1) the elimination of idle landlords and intermediaries, (2) a ceiling on holdings of substantial owners, (3) the confirmation of permanent rights to actual cultivators with the option for the lessee to purchase the holding outright at a fair price and (4) fixation of fair rent.

Land reforms involve multiple issues all of which call for equal attention but the ceilings question overshadowed all other questions relating to land. The politicians capitalised on its egalitarian appeal as a powerful instrument to rope in votes for themselves. However, the most pressing question concerned tenancy and this was taken up first.

1950–1960: Land to the Tiller. The first principle of land reforms to be put into operation was the principle—land to the tiller. This meant that absentee landlords and intermediate tenants had to be eliminated. At the time of independence, about 40 per cent of the total land in the country belonged to landlords in the form of zamindaris, jagirs, imams etc. These landed estates and their intermediate tenants were abolished during the periods of the 1st and 2nd Plans. As a result, about 20 million tenants have been brought into direct relationship with the state.

Conferment of Ownership Rights Provision for the conferment of ownership rights on tenants has been made in the laws of Andhra Pradesh (Telengana area), Assam, Gujarat, Himachal, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Manipur, Orissa, Rajasthan and Tripura. In the Andhra area in Andhra Pradesh, Haryana and Punjab the tenants have been given the right to purchase the land cultivated by them.

Security of Tenure. Security of tenure has three essential elements, namely, (i) that the ejectment of tenants does not take place except in accordance with the provisions of the law, (ii) that the land should be resumed by the owner, if at all, for personal cultivation only, and (iii) that in the event of resumption, the tenant is assured of a minimum area. All the laws provide for measures against the ejectment of tenants except in accordance with the law. The laws also provide for a minimum area being left with the tenants as absolutely non-resumable. The laws in Karnataka and Uttar Pradesh do not permit any resumption even for personal cultivation. The right of resumption of land for personal cultivation has expired in all States except Andhra Pradesh, Bihar, Haryana, Punjab, Tripura and in a limited form in Assam & West Bengal.

Fair Rent. The national policy on rent envisages that except for adequate reasons, rent should not exceed 1/5th to 1/4th of the gross produce. The rates as provided for in the laws of Assam, Maharashtra, Rajasthan, Kerala, Gujarat, the Telengana area of Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Karnataka, Manipur, Orissa and West Bengal are in line with the norms laid down. In the laws of Andhra Pradesh (Andhra area), Haryana, Punjab and Tamil Nadu, the rates are somewhat higher. In Bihar, the *under-raiyat** is required to pay rent at a rate not exceeding 7/20ths of the produce from the land held by him from a *raiyat*.† Where rent is paid in cash, the landlord cannot charge rent exceeding 150 per cent of the land revenue payable by him to the State. In Uttar Pradesh, the rent can be agreed upon by the tenant and the landlord or it can be fixed on an application filed by either party to the revenue authorities.

Consolidation of Holdings. Land holdings in India are, by and large, too fragmented and small to lend themselves to economic cultivation. Consolidation of holdings has therefore been accorded high priority. Necessary legislative measures have been enacted in all the States except for the Andhra area of Andhra Pradesh, Arunachal Pradesh, Mizoram, Manipur, Meghalaya, Nagaland, Tripura, Tamil Nadu and Kerala. Consolidation can be done either voluntarily or compulsorily. The laws of Gujarat, Madhya Pradesh and West Bengal provide for voluntary consolidation. Progress in consolidation of holdings in the different States has been uneven. The work is practically complete in Punjab, Haryana, and western U.P. In the remaining states the work is yet to gather momentum. By 1977 more than 4.4 crore hectares of land have been consolidated throughout the country.

Ceilings. 1960–61: Legislation providing for maximum extent of land which a person may hold or in future acquire was enacted in most of the States. These laws have also generally been brought into force and are under different stages of implementation. Provisions relating to the level of ceiling, the unit of application of ceiling, transfers and exemptions vary considerably from State to State.

1971–72: **Revisions of Ceilings.** On Aug. 3, 1972, the Central Land Reforms Committee recommended that the ceiling on landholdings should be reduced to 10–18 acres for irrigated land growing two crops, 27 acres for partially irrigated land growing one crop and 54 acres for dry land for a family of five consisting of father and mother and three minor children. The ceiling laws were to have retrospective operation.

The Committee has also recommended that the exemptions, granted under the original enactments, should also be removed, so as to release a larger extent of land for distribution among the landless.

Legislative measures in accordance with the national guidelines have been enacted in all the states where land ceilings are applicable. Nagaland and Meghalaya do not require any such legislation since land is commonly owned by the community. This is also the case with the Union Territories of Arunachal and Mizoram. Lakshadweep has not undertaken such legislation for a different reason. There is no landholder there who owns land beyond the ceiling limits.

Surplus Land. 8.10 lakh hectares of surplus land acquired under the ceiling laws of 1960–61 have been distributed among 10.60 lakh landless rural families. Under the new ceiling laws of 1971–72 about 25.02 lakh hectares of land have been taken over, out of which 17.48 lakh hectares have been distributed among 11.26 lakh landless families.

Along with this work, States and Union Territories have gone on distributing large tracts of waste, fallow and other categories of public land, that can with some effort be brought under the plough.

In the distribution of surplus land, preference is given to landless agricultural workers, particularly those belonging to the Scheduled Castes and the Scheduled Tribes.

Homestead Rights. Most of the rural folk live on other people's lands where they have put up homesteads, mainly mud huts or thatched sheds. Land reforms contemplate giving such dwellers permanent rights to their homesteads. In 1973 a set of guidelines were issued to all States and Territories to confer ownership of homestead sites to such dwellers.

These homestead tenants have been provided security under specific provisions of the tenancy laws in most of the States and Union Territories. In Karnataka, Kerala and West Bengal, the dwellers can purchase at their own initiative ownership right in respect of the homestead land occupied by them. In Assam and Himachal Pradesh, the rights of certain categories of the homestead tenants are yet to be fully protected

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* Sub-tenant cultivator. † Tenant cultivator

Provision of House-sites. Over 71 lakh house-sites were distributed by the end of December, 1976 among the rural poor. The State Governments are continuing the process of distribution of available land and also acquiring land, wherever necessary, so that the needs of the rest can be fulfilled.

128. RURAL DEVELOPMENT

The Ministry of Rural Reconstruction, formerly a department in the Ministry of Agriculture, was formed into a separate ministry in August 1979. The new ministry is to co-ordinate various functioning programmes of rural development, like the *Small Farmers' Development Agency* (SFDA), the *Drought Prone Areas Programme* (DPAP), *Command Area Development* (CAD)*, Desert Development Programme (DDP) and other rural oriented schemes into an *Integrated Rural Development Programme* (IRDP) and generally to help the poorest of the poor in the villages to rise above the poverty line by earning substantial incremental incomes.

Poverty Line in this context has been drawn at the annual income of Rs. 3500 for a family of 5 persons. All families below this line form the target group. The target group comprises small and marginal farmers, agricultural and non-agricultural labourers, rural artisans and craftsmen and families belonging to the scheduled castes and tribes. The programme is to be implemented through a district level authority known as *Rural Development Agency.* The twin objectives of raising income and generating employment are to be achieved through investment in agriculture and ancillary occupations, cottage and small industries and any other viable economic activity which suits the beneficiary family.

Two preliminary steps are necessary before the IRDP can be worked successfully. They are land reforms and decentralisation of the administration. Land reforms are necessary because land forms the background and the backbone of the rural economy. This is discussed in the section Land Policy (supra). Decentralisation of administration is essential since the IRDP is to be implemented at the grassroots level where the village forms the basic social and economic unit.

Panchayati Raj. The decentralised system of administration is officially known as Panchayati Raj or government by panchayats. Panchayat, literally meaning a body of 5 persons, is the age-old administrative body of the Indian village. It is now to be incorporated as part of the modern democratic system.

Panchayat system is already in operation in many states, although these panchayats have very little powers of their own. New legislation is necessary to strengthen the Panchayati Raj. It was decided at a Chief Ministers' Conference in May 1979 to prepare a model legislation to be enacted by all states.

Gram Panchayats. As on the 31st March, 1980, there were 2,12,248 gram panchayats (covering 5,94,837 villages and a population of 445 million), 74481 panchayat samitis and 252 zilla parishads respectively in the country.

The IRD Programme offers assistance for financing a large variety of economic activities. The programme envisages the identification of beneficiaries on the basis of objective criteria and the identification is to be done on the basis of proper inquiry by the implementing agencies. The integrated rural development programme in which programmes relating to small farmers development agency, special livestock production, training of rural youth for self-employment and area planning for full employment have been merged, now covers all the 5011blocks in the country and is meant for the benefit of the poorest among the poor in the rural sector, taking the family as the basic unit of development.

After identifying each individual household, appropriate economic activities would be determined in consultation with the beneficiary concerned and suitable bankable schemes would be drawn up. The capacity of the beneficiary to take risks, his existing resource base and his managerial ability are to be considered before schemes are drawn up. The IRD programme is financed partly by subsidy and partly by bank loans. Nearly 2/3 of the resources required for implementing the programme have to come from the co-operative and commercial banks.

Antyodaya. The IRD programme is in effect the *Antyodaya* programme started in Rajasthan and some other States earlier. Antyodaya literally means 'to the last in the line' which in the language of the IRD is known as the 'poorest of the poor'. The strategy of both programmes is the same, namely, to put on the road to self-sustaining economic independence, those who have hitherto been stagnating in the lowest levels of **poverty**.

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* *See Irrigation* (infra).

SFDA. *The Small Farmers Development Agency* Programme included 87 projects in the IV plan and 168 projects covering 1818 blocks during the V plan.

The main emphasis in these projects has been on crop husbandry which includes intensive agriculture, multiple cropping, introduction of high yielding varieties, horticulture, development of minor irrigation, soil conservation, land shaping, land development etc. with emphasis on adoption of dry farming practices and water harvesting methods in the rainfed areas. The subsidiary occupations of milk production, poultry, piggery and goat and sheep rearing are also undertaken by the agencies.

Special Livestock Production Programme initiated in the year 1975—76 and continued thereafter, aims at providing greater employment opportunities to the weaker sections of the rural population. This programme is in operation in 21 states and 4 union territories.

DPAP. *The Drought Prone Areas Programme* was started during the 4th plan as a rural works programme of a long term nature in areas subject to recurrent droughts, so as to provide employment to people in these areas.

The programme aims at conservation, development and optimum utilisation of the land, water, livestock and human resources in the areas selected. These will be planned on a water-shed basis. The Fifth Plan envisaged an investment of Rs. 336.94 crores for the programme. The actual utilisation till the end of 1978—79 amounted to Rs. 269 crores.

Rural Employment. The problem of rural employment is as diverse as it is extensive. A total strategy to tackle the problem has been evolved by breaking up the unemployed people into 3 categories. 1. Unskilled workers capable of manual labour only. 2. Semi-educated and educated personnel belonging to families below the poverty line. 3. Educated personnel belonging to families above the poverty line.

The national rural employment programme (NREP) which replaced the food for work programme in October 1980, offers job opportunities to the rural poor as well as seeks to develop and strengthen the rural infrastructure. The work projects taken up under this programme consist of afforestation, and social forestry, land development, land levelling and soil conservation, minor irrigation works, construction of water channels and community drinking water wells/schemes, digging and deepening of village tanks, construction of rural link roads, schools, dispensary, community centre buildings etc. This programme now forms a regular part of the sixth five-year plan.

Trysem. *Training Rural Youth for Self-Employment* is considered the best solution to the problem of unemployment among the poor educated youth. It is proposed to train at least 2 lakh rural youth every year in some skill or technology so as to enable them to take up self-employment projects. In 1979—80 and 1980—81, 93,018 trainees in various trades like tailoring, electrical fittings, welding etc. have been trained. Out of these, 9, 266 youths have become self-employed.

Educated youth belonging to well-off families are to be provided vocational guidance and counselling services, so as to enable them to take up projects of their own. They will be provided with a loan, not exceeding Rs. 5000, as seed money for the projects.

ISB. *The Industries Services and Business* component was built into the IRD programme in February 1979 with the object of maximising the employment opportunities in the secondary and tertiary sectors. It was felt that the absorption capacity of the farm sector would soon reach a saturation point and that there was no choice but to promote the secondary and tertiary sectors for providing greater employment in the rural areas.

Agricultural Marketing, Storage and Warehouse provide a fruitful outlet for employment in the secondary and tertiary sectors.

The desrt development programme was launched during the year 1977—78 based on the recommendations of the National Commission on Agriculture, as a central sector programme. The programme covers the hot arid desert areas comprising 11 districts of Rajasthan (namely, Ganganagar, Bikaner, Churu, Jhunjhunu, Sikar, Nagaur, Jodhpur, Jaisalmer, Barmer, Jalore and Pali), 4 districts of Haryana (Hissar, Bhiwani, Rohtak and Sirsa) and 3 districts (Banaskantha, Mehsana and Kutch) of Gujarat and the cold arid desert areas of Ladakh in Jammu and Kashmir and Spiti sub-division of Lahaul and Spiti in Himachal Pradesh.

129. AGRICULTURE

Agriculture which accounts for about 48 per cent of the national income is the kingpin of the national economy. It dominates the national scene.

Agriculture, in its turn, is dominated by foodcrops. As much as 75 per cent of the total cropped area is taken up by foodcrops. Both tradition and necessity have contributed to the pre-eminence of foodcrops in the country.

Crops and Seasons. There are two main crop seasons in India, the *kharif* and the *rabi*. These seasons have been determined by long usage, which itself has been determined primarily by rainfall. The *kharif* season opens in May and banks heavily on the south west monsoon. The *rabi* opens in the middle of October, as the south west retreats and the north east monsoon takes over.

Table 123

Crops Seasons

Sowing and Harvesting Periods of Crops

Season	*Periods*	*Sowing period*	*Harvesting period*	*Principal crops*
Kharif	May to Middle of Oct.	Generall at the beginning of the South-west Monsoon-May to July	At the end of the South-west Monsoon—Sept. to Oct. (may continue till November in some cases)	Jowar, Bajra, Rice, Maize, Ragi, Tur, Moong, Urd, Sugar-cane† Groundnut, Castor, Sesamum, Cotton, Jute and Tobacco
Zaid Kharif	August to January	August to September	December to January	Rice, Jowar, Rapeseed and Mustard, Cotton, Oil seeds and Toria
Rabi	Middle of October to Middle April	At the beginning of the cold weather-October to December	February to April (may continue till May in some cases)	Wheat, Barley, Gram, Linseed, Mustard, Masur, Oats, Peas and Potatoes
Zaid Rabi	Beginning of February to beginning of May	At the beginning of hot weather—Feb. to March	Middle of April to May (may continue up to June in some cases)	Water-melon, Toria, Summer Vegetables, Jowar and Maize for fodder

Source: Indian Crop Calendar.

Pre-monsoon rains (March to May) are important for the sowing of *kharif* crops like autumn rice and jute. The main monsoon (June to Sept.) covers the growth and harvesting of *kharif* crops. Post-monsoon rains (Oct. to Dec.) are essential for the *rabi* crops. If the monsoon is delayed or weakened it may lead to drought conditions. On the other hand, if the monsoon pours forth in full force, floods are likely to cause crop losses.

Area under Principal Crops

Food Crops account for a little over 80 per cent of the gross cropped area and non-food crops, the rest of the area.

Foodgrains make up 95.5 per cent of the total area under food crops. Sugar cane (1.8 per cent), fruits (1.7 per cent) and other food crops (1 per cent) account for the balance area of 4.5 per cent. Among foodgrains, cereals take up 82.6 per cent and pulses 17.4 per cent.

In the total area under cereals, rice leads with about 36 per cent, followed by wheat 18 per cent, jowar 16 per cent and bajra 13 per cent.

Pulses cultivation, either in rotation with creals or inter-spaced with cereals, accounts for about 21 million ha. or 13.3 per cent out of the gross cropped area of 158 million ha.

Bengal gram represents the largest single item in pulses cultivation, accounting for an area of 7.4 million ha. Tur/Arhar/Red gram covers 2.4 million ha. The rest of the varieties are grown over an aggregate area of 11.3 million ha.

Crop Production in 1979–80. The unprecedented drought of 1979–80 caused a severe set-back to agricultural production in the country. The drought had affected an area of about 38 million hectares in 11 states. The production of foodgrains dropped to 108.9 million tonnes from the record level of 131.9 million tonnes achieved in 1978–79. This represented a fall of about 23 million tonnes or 17.4 per cent.

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† Sugar-cane is an annual crop, duration 10—12 months.

The production of commercial crops, particularly sugarcane and oilseeds, suffered heavily in 1979–80. In the case of cotton and jute & mesta, however, the decline was marginal.

The following Tables show the area under major crops and Production of Food & Non-food crops.

Table 124

AREA UNDER MAJOR CROPS

(In million hectares)

Group/Commodity	*1960-61*	*1974-75*	*1978-79*	*1979-80*	*1980-81**
A. Foodgrains	115.58	121.08	129.01	125.21	125.79
(a) Cereals	92.02	99.05	105.35	102.95	103.16
Rice	34.13	37.89	40.48	39.41	39.77
Wheat	12.93	18.01	22.64	22.17	22.10
Jowar	18.41	16.19	16.14	16.67	15.61
Maize	4.41	5.86	5.76	5.72	5.98
Bajra	11.47	11.29	11.39	10.58	11.63
Other cereals	10.68	9.82	8.94	8.39	8.06
(b) Pulses	23.56	22.02	23.66	22.26	22.63
Of which: Gram	9.28	7.04	7.71	6.09	6.72
B. Non-Foodgrains:					
(a) Oilseeds (5 major)**	13.77	15.64	15.90	15.07	15.62
Of which: Groundnuts	6.46	7.06	7.43	7.16	6.90
Rapeseed and Mustard	2.88	3.68	3.54	3.47	4.06
(b) Sugarcane	2.42	2.89	3.09	2.61	2.65
(c) Cotton (Lint)	7.61	7.56	8.12	8.08	7.87
(d) Jute	0.63	0.66	0.88	0.83	0.94
(e) Mesta	0.27	0.32	0.38	0.38	0.36
(f) Potato	0.38	0.59	0.80	0.69	0.73

Table 125

AGRICULTURAL PRODUCTION

(In Million Units)

Group/Commodity	*Unit*	*1960-61*	*1973-74*	*1978-79*	*1979-80*	*1980-81*
A. Foodgrains	Tonnes	82.33	104.67	131.90	109.70	129.87
(a) Cereals	Tonnes	69.59	94.66	119.72	101.13	118.70
Rice	Tonnes	34.60	44.05	53.77	42.33	53.23
Wheat	Tonnes	11.00	21.78	35.51	31.83	36.46
Jowar	Tonnes	9.90	9.10	11.44	11.65	10.50
Maize	Tonnes	4.12	5.80	6.20	5.60	6.80
Bajra	Tonnes	3.29	7.52	5.57	3.95	5.42
Other Cereals	Tonnes	6.69	6.41	7.23	5.77	6.28
(b) Pulses	Tonnes	12.73	10.00	12.18	8.57	11.17
Of which: Gram	Tonnes	6.26	4.10	5.74	3.36	4.65
B. Non-Foodgrains						
(a) Oilseeds** (5 major)	Tonnes	6.87	8.85	9.35	8.04	8.34
Of which: Groundnuts	Tonnes	4.70	5.93	6.21	5.77	5.02
Rapeseed and Mustard	Tonnes	1.35	1.70	1.86	1.43	2.25
(b) Sugarcane (in terms of gur)	Tonnes	11.41	14.43	15.73	13.09	15.40
(c) Cotton (lint)	Bales @	5.55	6.31	7.96	7.70	7.60
(d) Jute	Bales†	4.14	6.22	6.47	6.07	6.52
(e) Mesta	Bales†	1.11	1.46	1.86	1.89	1.68
(f) Potato	Tonnes	2.72	4.86	10.13	8.33	9.60

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* Final Estimates.

** Includes five major oilseeds viz groundnuts, rapeseed and mustard, sesamum, linseed and castorseed.

@Bale=170 kgs. † Bale=180 kgs.

Source: Economic Survey 81-82

Spices. India is known as the home of spices. Out of the seventy spices listed by the International Organisation for standards, almost all of them are grown in India. The annual production of all the spices put together comes to 1.5 million tonnes. Though fairly large quantities are exported bulk of the production is consumed within the country. The export of spices from India during 1979–80 was an all time record in quantity with 1,14,959 tonnes valued at Rs. 155 crores. The share of Indian exports in the world trade of spices is about 25%.

Pepper. Among the Indian spices, pepper is the most important. It is native to the Western Ghats of India. Though the country had a monopoly for pepper production earlier it now accounts for only 20% of the world output. Pepper is grown in an area of 1,10,640 hectares in the southern part of the country producing 27,410 tonnes annually. The world's first and only hybrid variety, 'Panniyur-I' was evolved at the Pepper Research Station, Panniyur in Kerala State. Pepper is a small farmers' crop and generally grown as a mixed crop in the homestead gardens. The export during 1980–81 was 25,337 tonnes valued at Rs. 37 crores. The commercial grade, Malabar Garbled Extra Bold fetches highest price in the international market.

Cardamom. Cardamom, the Queen of Spices is the next most valuable spice. The crop is indigenous to South India. India is the largest producer with 4,400 tonnes. Cardamom export during 1980–81 was 2,437 tonnes valued at Rs. 36 crores. West Asian countries are the major markets for Indian Cardamom. "Alleppey Green" is the most sought after cardamom in the world.

Ginger, Turmeric and Chillies: India is the largest producer of ginger and turmeric in the world accounting for 60% and 90% of the total output respectively. The annual production of ginger is around 80,000 tonnes and of turmeric 1,99,000 tonnes. During 1980–81, 5,550 tonnes of ginger and 11,438 tonnes of turmeric were exported fetching Rs. 9 crores. 'Cochin ginger' and 'Alleppey turmeric' get premium price in the international markets. India is also the world's largest producer of chillies (Capsicums). The varieties commercially grown are of medium pungency. The production was 4,85,400 tonnes during 1980–81. Export of chilli is negligible and more than 95% of the production is consumed locally. There is vast scope for growing the mildest paprikas to the most pungent chillies.

Other Spices. Several spices like coriander, cumin, fennel, fenugreek, celery, aniseed, saffron etc., the annual production of which come to 4,70,000 tonnes are grown in India. The areas under these crops are not extensive. However, these are very important spices as they form essential ingredients in culinary, confectionery and medicinal preparations. Domestic consumption of these spices is quite substantial. During 1980–81, 22,100 tonnes of these spices valued at Rs. 14 crores were exported. Production and export of onion and garlic has also picked up recently. Apart from these spices, clove, nutmeg, cinnamon and vanilla are also grown in India.

Export and Unit Value of spices 1960–61 to 1981–82

Year	*Qty. Exported ('000 tonnes)*	*Value (Rs. in Crores)*
1960–61	47.2	16.6
1965–66	62.2	23.1
1970–71	48.0	38.8
1975–76	61.9	72.7
1976–77	60.9	75.9
1977–78	81.2	141.9
1978–79	99.9	160.2
1979–80	115.0	155.1
1980–81	77.0	104.8
1981–82	68.4	93.2

130. THE FOOD PROBLEM

Famines. Food has always been a critical element in the Indian economy, mainly because droughts and floods have been ravaging the country from time to time. Indian agriculture banks heavily on rainfall. In a country so dependent on rainfall for its food, famines pose a perpetual threat.

We have no record of the extent of devastation caused by famines, before the British rule. It was the British administration that first started assessing the casualties and damages caused by famines in India and worked out policies to keep them in check. During the British rule, local famines in scattered areas were quite frequent. Now and then some of these famines turned calamitous and shook the country throughout its length and breadth.

In 1770, a terrible famine broke out in Bengal, killing nearly a third of the population. In 1866–67, Orissa and the east coast of India from Madras to Calcutta were struck by another devastating famine. In 1876 a third famine, that ranged over a vast area comprising Madras Presidency, Mysore and Hyderabad States, Bombay Presidency and United Provinces and lasted two years, decimated the population in the entire area.

After the 1876 famine, the Government of India appointed a Famine Commission under Sir Richard Strachey to investigate and identify the causes of famine and to suggest measures to combat them. The recommendations of the Strachey Commission formed the basis of the Famine Code promulgated by the Government of India in 1883 and of various provincial codes drawn up by provincial governments. Two more Commissions were appointed subsequently—one under Sir James Lyall in 1897 and the other under Sir Antony MacDonnell in 1900. These Commissions by and large supported the findings of the Strachey Commission and suggested only minor changes in Famine policy. But the fact that these Commissions were appointed is significant. It showed how badly the people were shaken by the prospect of famines.

The primary cause of famines is obvious—drought or the failure of rains during critical crop seasons. No Commission was necessary to find it out. The problem was how to contain drought and consequent shortage of food supply.

Free India inherited this problem on a magnified scale. With the partition, India lost some of the vital centres of food production like Sind and East Bengal to Pakistan. So, while India got 82 per cent of the total population of undivided India, it got only 75 per cent of the total cereal production, 65 per cent of wheat production and 68 per cent of rice production. Thus the imbalance between population and food production was worsened.

Food Production. Independent India set about to rectify this imbalance by increasing food production. The Grow More Food Campaign started by the British Government during World War II was intensified. More funds were allocated in the Plan for agricultural development. In 1954, the then Minister for Agriculture, Rafi Ahmed Kidwai, took the bold step of abolishing all controls on food production. With a free market in operation, food production increased from 57.6 million tonnes in 1951 to 68.8 million in 1956. During the Second Plan, although food production increased to 75 million tonnes, demand went up higher still and the gap was filled up by food imports from abroad. During the Third Plan, agricultural production remained stagnant. Worse, it came down to 72.3 million in 1966. The situation improved slightly in 1967 with a production of 74.2 million.

Green Revolution. In 1967–68, there was a significant improvement in wheat production both in India and Pakistan. The spectacular rise in wheat production in the Punjab, Haryana and north western UP came to be called the "Green Revolution". The Green Revolution was primarily based on new strains or hybrid varieties of seeds, which were capable of high yields. As a result, agricultural production not only recovered from the slump of 1965–67, but shot up spectacularly to a level of 99.5 million tonnes in 1969–70, higher than the previous peak in production achieved in 1964–65.

High Yielding Varieties. Under the Fourth Plan (1969–74) the principal programme for achieving increased food production was to raise the coverage under the high yielding varieties from the base level of 9.2 million hectares in 1968–69 to 25 million hectares in 1973–74.

This long term strategy ran aground in 1973. Food production which increased from 99.5 million tonnes in 1969–70 to 108 million in 1971–72 declined to 105 in 71–72 and crashed to 97 million in 1972–73. The erratic monsoon in 1972 coming after three successive bumper crops put the Green Revolution out of gear.

For more than 25 years, India has been planning to release agriculture from the stranglehold of weather. The Green Revolution brought a break or so it seemed. But it turned out that it could not survive the weather, either. Nevertheless, the High Yielding Varieties Programme was continued.

The seventies (1970–71 to 1979–80) witnessed a more than twofold increase in the area under High Yielding Variety Programme (HYVP). From 15.38 million hectares out of the gross cropped area of 165.80 million hectares in 1970–71, the programme has travelled a long way in a decade, the area under HYVP being 35.20 million hectares out of the total sown area of 171 million hectares in 1979–80

Similarly, the percentage share of area under HYVP to the gross cultivated area has gone up appreciably. From 9.3 per cent in 1970–71, it slowly picked up to 16.6 per cent in 1974–75 and in 1978–79, (when the area under the high yielding programme was maximum) its share in the gross cropped area rose to 23.7 per cent, but declined marginally to 20.6 per cent in 1979–80.

The area under high yielding varieties which is a key indicator of the application of modern technology to agriculture has been very impressive in regard to both the important cereals, viz rice and wheat Area under HYV rice has shown a remarkable upward trend, from 12.4 million hectares in 1975–76 to 16.9 million hectares in 1978–79. Area under HYV wheat rose from 6.5 million hectares in 1970–71 to 11.2 million hectares by 1978–79.

The vulnerability of the HYV Programme to weather is indicated by the fluctuations in HYVP acreage. The maximum area under HYVP so far, was in 1978–79 at 41.10 million hectares. During 1979–80, because of adverse conditions in the kharif season, the total area under the programme slid down considerably to 35.20 million hectares.

Although high yielding varieties are helpless against the weather, they have been instrumental in removing the food problem from the crisis category. The increased yields they promise have banished the spectre of famine from the land.

Buffer Stock. In order to provide for unexpected shortfalls in foodgrain production, a buffer stock is being maintained by the Central Government. The buffer stock was estimated to be 11.4 million tonnes in February, 1981.

131. IRRIGATION

The High Yielding Varieties Programme (HYVP) has focussed attention on two aspects of agriculture, namely irrigation or water management and fertilisers. The HYVs call for regular water supply and in crops like cereals plenty of it. The problem of irrigation is to conserve the available water supply and turn it over to the crops at the proper time and in sufficient quantities. The time and the quantity are important. If the water is let into the field too early or too late it will adversely affect the yield. The same thing will happen, if the water in the field is either too little or too much. There is always the possibility that the water may be too little or too much.

Paradoxical though it looks, this problem has been created by rains. Rainfall in India is not evenly distributed through the year. It is uncertain, erratic and altogether unpredictable. Sometimes, a particular area may receive the total rainfall for the year in a few days, without another drop of rain for the rest of the year. Often, the drought that follows the rains is so intense that the surface ground water is evaporated in a very short period, leaving no residual moisture in the soil. Even Cherrapunji[†] in Meghalaya, the rainiest spot in the world, experiences water shortage when the monsoon is over.

Heavy rains invariably cause water-logging in low-lying regions and soil erosion in high level areas, not to mention the damages occasioned by floods. Intense drought coming in the wake of heavy rains accentuates the probelm.

Irrigation is nothing new to India. Ancient India had erected vast irrigation works to support its agriculture. Some of the old dams and irrigation canals, still existing, testify to this. It is, however only in recent years that the problem of irrigation has been taken up on a scientific basis all over India. It is now admitted, all round, that irrigation is the first basic input for a successful agricultural economy.

A planned system of irrigation has to take into account: (1) the supply of necessary water to the crops in season, (2) the drainage and disposal of excess water, especially when it is out of season, (3) prevention of flood damages, (4) conservation or stocking of water for release in dry seasons, (5) conservation of soil in higher elevations and the prevention of erosion by sea in coastal tracts All these activities come under the Ministry of Irrigation.

Water Resources. India is endowed with substantial water resources The total water resources of the country are assessed at 178 million hectare metres However, on account of limitations of physiography, topography, geology, dependability, quantity and the present state of technology, only a part of this will be utilised It has been assessed that about 67 million hectare metres of surface water and 26.5 m. ha. metres of ground water can be tapped and utilised The land area that can ultimately be irrigated has been assessed to be 113 million hectares as against a possible gross cropped area of 210 million hectares on full development of irrigation potential. Thus, on present assessment, it may not be possible to provide irrigation facilities to the entire cultivated area in the country. A national scheme of interlinking the various river systems and creation of storages has been evolved.

[†] Actually the place that receives the maximum amount of rainfall in the world is not *Cherrapunji but Mawsyuran,* 10 km from Cherrapunji The name Cherrapunji is retained as it is the long familiar name After all 10 km do not make much difference in such matters (see also *Meghalaya* infra)

National Plan. The Ministry of Irrigation in consultation with Central Water Commission has formulated a National Perspective for Water Resources Development which envisages creation of optimum storages on various rivers, wherever feasiable, and transferring the surplus flows for utilisation in deficit regions by constructing inter-connecting links. The perspective comprises two main components, viz. (1) Himalayan Rivers Development and (2) Peninsular Rivers Development.

Peninsular Rivers Development consists of 4 major parts as given below:—

I. Interlinking of Mahanadi-Godavari-Krishna-Pennar-Cauvery.
II. Interlinking of the West Flowing Rivers, North of Bombay and South of Tapi.
III. Interlinking of Ken with Chambal.
IV. Diversion of the West Flowing Rivers.

The overall scheme is estimated to cost approximately Rs. 50,000 crores and would give additional benefit of 25 million hectares of irrigation by surface waters, 10 million hectares by increased use of ground waters and generation of 40 million kilowatts of power, apart from benefits of flood control, navigation etc. The details of this plan are yet to be finalised in consultation with the State Governments.

Progress of Irrigation. Prior to 1951 the total area irrigated in the country was 22.6 million ha. (9.7 million ha. from major and medium irrigation projects and 12.9 million hectares from minor schemes both surface and ground). The irrigation potential increased to 52.1 million hectares by the end of the Fifth Plan in 1977–78, out of which 24.8 million hectares was from major and medium irrigation projects and 27.3 million hectares from minor schemes. Between 1978 and 1980, an additional potential of 4.5 million hectares was created (1.8 million hectares from major and medium irrigation and 2.7 million hectares from minor schemes). The aggregate irrigation potential to the end of 1979–80, the beginning of the Sixth Plan, was 56.6 million hectares. During 1980 81 an additional potential of 2.3 million hectares has been created, bringing the aggregate to 58.9 million hectares. The target for 1981–82 is 2.68 million hectares.

In tune with this long term objective, the Sixth Plan commencing from 1980–81 envisages creation of an additional irrigation potential of about 14 million ha. An outlay of Rs. 10258 crores has been provided for major, medium and minor irrigation. In addition, about Rs. 1700 crores are anticipated to be available for minor irrigation from Institutional Sources, thus adding upto an outlay of the order of Rs.12000 crores. The command area development is recognised as very important for reducing the gap in utilising the potential created and also for increasing the efficiency of water use and the productivity from irrigated lands. In due recognition of this, CAD in the Sixth Plan has been given an allocation of Rs. 865 crores.

Sources of Irrigation. The sources of irrigation in India are major, medium and minor *surface sources* and *ground water sources,* mainly wells and tubewells. Of the total area irrigated, 40% is served by major and medium surface water sources, 20% by minor surface water and 40% by groundwater sources.

The concepts of major, medium and minor irrigation have changed in course of time. When planning was started (1950–51) major, medium and minor irrigation schemes were divided on the basis of cost. Major schemes (more than Rs. 5 cr.), medium (Rs. 10 lakhs to 5 cr.) and minor (less than Rs. 10 lakhs). In 1978 they were redefined on the basis of acreage served: major—more than 10,000 hectares, medium—2000 to 10,000 ha. and minor—less than 2000 ha.

Table 126

Ultimate and Utilised Potential 1980

Million Hectares*

	Ultimate	*Utilised*
Major nd Medium Projects	58	26
Minor Projects	15	8
Ground Water	40	22
Total	113	56

* Fractions omitted

Low Utilisation. It will be seen that in thirty years' time we have been able to utilise just about half of the irrigation potential. This is due to a number of factors, institutional and technical. Institutional factors include lack of coordination between departments, inordinate delay in execution and similar other dfficulties. Technical difficulties arise primarily in the delivery of water to the farms concerned.

One of the technical improvements suggested in the delivery system is *Rotational Water Supply* (RWS), popularly called *waribandi*. RWS visualises assured supply of water by turn on a per hectare basis according to crop requirements. The crop requirements are determined on the basis of agronomical studies conducted in the locality, the prevailing cropping pattern, the nature of the soil and other relevant factors.

The losses in transit as well as the time taken for water to reach the tail end farms, are taken into account before fixing the day, the time and the duration of the rotation for the farms in the area. This is a very difficult system to work out unless the farmers in the area actively cooperate to make the project a success. Such cooperation may not always be forthcoming.

However, one thing is certain. If the water supply is fluctuating and uncertain, the farmers will throw out the HYVs and fall back on low yielding local varieties and thus make the best of a bad bargain.

The Command Area Development Programme (CAD Programme) was introduced during the Fifth Plan period to overcome these difficulties. The programme envisages development of irrigation by the construction of field channels and access roads, land levelling and land shaping, introduction of the Rotational Water Supply system (RWS) and popularisation of integrated crop-soil water management practices. The programme stresses the equitable distribution of water to small and marginal farmers, especially those at the tail ends of the project areas.

By 1980, 44 Command Area Authorities have been established covering 71 selected irrigation projects in 13 States and 1 (Salauli Irrigation Project) in the Union Territory of Goa. The total irrigation potential so far created through the CAD programmes is estimated to be 15.02 million hectares.

Flood Control. During the year 1981, the south west Monsoon reached Kerala on 30th May, 1981, 2 days in advance, and by 10th July, 1981, the entire country was under the influence of the monsoon. The rainfall was in excess of the normal in the State of Gangetic West Bengal, Madhya Maharashtra, Rayalaseema, Tamil Nadu, North interior Karnataka & Kerala while it was deficient in the States of Nagaland, Manipur, Mizoram, Tripura, West Uttar Pradesh, Punjab, Himachal Pradesh, West Rajasthan and normal in the rest of the country. The monsoon withdrew from large parts of the country with effect from 12th October, 1981.

There were several spells of very heavy rainfall in various parts of the country. Jaipur city in Rajasthan recorded unprecedented rainfall from 18th to 20th July, 1981. The rainfall during these days was 82 cm. as against annual average rainfall of 59.8 cm. On the 10th July, in a single day, Jaipur experienced rainfall of 35 cm. which is a record so far. This unprecedented rainfall caused heavy damage to the city of Jaipur and the surrounding areas.

Bombay and its suburbs had very heavy downpour in September, 1981 and the Santa Cruz raingauge recorded 32 cm. of rainfall in a single day.

Heavy rainfall was also experienced at Agra, Manipur, Aligarh, Delhi, Ahmedabad, Rajkot, Bhuj Indore, Ramagudam, Bhuvaneswar, Titalgarh, Kozhikode, Mangalore, Mahabaleswar, Allahabad, Gorakhpur, Azamgarh, Mount Abu,Cherrapunji, Sandheads, Ahmednagar, Valurghat, Kolar Gold Fields, Tiruchirapalli, Yeotmal, Dahanu, Karalikal, Noncowrie. Nagapattinam and Guddalore.

Floods occurred in Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Kerala, Maharashtra, Orissa, Punjab, Rajasthan, Tamilnadu, Tripura, Uttar Pradesh, West Bengal, Delhi and Goa, Daman and Diu.

The total damage due to heavy rains/floods and cyclones based on the information received upto 31-12-81 from the State Governments is assessed to be Rs. 413.54 crores. The past maximum was Rs. 830.00 crores in 1980, while the average annual damage during the period 1953 to 1980 was Rs. 327 crores and average damage in last 5 years from 1976 to 1980 was Rs. 998 crores. Bulk of the damage occurred in the States of Gujarat and Uttar Pradesh. In Rajasthan, the loss of human lives was reported to be 371 due to floods and house collapses.

The flood forecasting systems established on all the major inter-state rivers in the country provided timely flood warning which enabled the State Governments to take advance precautionary measures for the evacuation of people, live-stock and movable properties in unprotected area, as also for measures to safeguard the existing flood control works.

Flood Protection Measures. Since the launching of the National Flood Control Programme in 1954, an area of 11.57 million ha. has been provided reasonable degree of protection upto March, 1981, out of the total protectable area of about 32 million hectares in the country. The flood control works implemented to provide this protection include construction of 12260 km of embankments, 21809 km of drainage channels, 304 town protection works and raising of 4700 villages. The expenditure on these works upto March, 1981 was Rs. 1137.97 crores.

The problem of sea erosion is very severe in Kerala where about 320 km out of a total 560 km of coastline is vulnerable to erosion. Upto March, 1981, the coastline in a length of 253 km has been provided protection at a total cost of Rs. 49.79 crores and another 18 km are likely to be covered during 1981–82. A major portion of the vulnerable length is expected to be protected during the Sixth Plan period.

132. FERTILISERS

Fertilisers have become a key input in the cultivation of high yielding varieties. The new varieties are heavy consumers of chemical fertilisers. In native varieties, if fertilisers are a little more or less, there will not be any appreciable differences in yield. No so the HYVs. If the prescribed doses of fertilisers are not applied these varieties will show vast differences in yield. Unfortunately fertiliser industry in India has not kept pace with the expansion of HYV cultivation. Consequently the country found itself short of fertilisers almost every year. The shortage had to be made good by imports. "This", says the Ministry of Agriculture, "cost the government an enormous amount of valuable foreign exchange because of the substantial increase in the international prices of imported fertilisers."

There has been a steady growth in the consumption of fertilisers in India. The demand for all the main groups of fertilisers, namely nitrogenous (N), phosphatic (P) and potash (K) have been on the increase as the following table shows.

Table 127

Consumption of Fertilizers

(Lakh tonnes)

Year	*N*	*P*	*K*	*N+P+K*
1975-76	21.5	4.7	2.8	29.0
1976-77	24.6	6.3	3.2	34.1
1977-78	29.1	8.7	5.1	42.9
1978-79	34.2	11.1	5.9	51.2
1979-80	35.0	11.5	6.1	52.6
1980-81	37.1	12.3	6.4	55.8

The consumption of fertilisers during 1980–81 is estimated to be 55.8 lakh tonnes as against the targeted level of 61.0 lakh tonnes. This represents an increase of 3.2 lakh tonnes over the previous year and 4.6 lakh tonnes over 1978-79 in which a record production of 131.9 million tonnes of foodgrains had been achieved. Although all efforts were made towards achieving the targeted level of consumption of fertilisers during 1980-81, the major constraints were the unfavourable weather conditions in many States and heavy shortfall in domestic production.

In spite of acute drought conditions in some states and generally aberrant weather in others, fertiliser consumption showed an increase of more than 6% in 1980 compared to the consumption in 1979. (see Table).

Table 128

Fertiliser Consumption 1979–81

lakh tonnes

	N	*P*	*K*	*Total*
Total (Kharif+rabi)				
1979-80	34.98	11.51	6.07	52.56
1980-81	37.09	12.31	6.36	55.76
Increase in 1980-81 over 1979-80				
Absolute	2.11	0.80	0.29	3.20
Percentage	6.0	7.0	4.8	6.1

Logistics. Logistics play a vital role in carrying out the policy of ensuring that the right type of fertilisers reach the farmers at the right time and place. Transportation of indigenous and imported fertlisers, handling of imported fertilisers at the ports and distribution of fertilisers raise a number of problems. Serious transport bottlenecks were experienced in 1980 with the result that stocks piled up at the ports and at the plants.

Hitherto, fertilisers were supplied f.o.r. to railheads nearest to the distributors. This had led to a clustering of retail outlets around such railheads, thereby resulting in inadequate availability of fertilisers in areas located remotely from railheads. This was considered to be one of the important factors responsible for the skewed pattern of fertiliser consumption in the country. At present, out of about 5000 blocks in the country as many as

2900 blocks have no railheads. It has now been decided that in future, arrangements will be made to deliver fertilisers at block headquarters.

Fertiliser Imports. In 1980—81 international prices of fertilisers rose so steeply that some suppliers failed to honour the contracts already made. All the same, imports during 1980—81 are likely to exceed the previous year's level due to short-fall in domestic production. It is estimated to reach a record level of over 5 million tonnes—10 lakh tonnes higher than the import in the previous year.

With the increasing imports of fertilisers required to bridge the gap between the growing requirements and domestic availability of this input, large quantities of imported fertilisers had to be unloaded and cleared from the ports. During the year 1980—81, 45.48 lakh tonnes of imported fertilisers were unloaded at both the major and minor ports upto the end of February, 1981. During the remaining one month of the year, i.e., March 1981, 5 lakh tonnes of fertilisers is expected to be handled at the ports, the total estimated for the year being 50.50 lakh tonnes of product. This represents an increase of 19.10 per cent over 42.37 lakh tonnes unloaded and cleared from the ports during last year. In order to ensure efficient handling of fertilisers at the ports, it is proposed to mechanise unloading and handling operations.

Fertiliser Prices. Government had to increase the prices of fertilisers by about 38 per cent with effect from 8—6—1980. This was necessitated by the steep increase in the prices of petroleum products which constitute the main feedstock of nitrogenous fertilisers, increase in the prices of other raw materials like imported sulphur, phosphoric acid and rock phosphate, steep increase in the prices of imported fertiliser and ocean freight etc.

The present prices of fertilisers are still below their full economic cost and the Government continues to subsidise the fertilisers significantly. It is too early to assess the impact of price hike on fertiliser consumption.

As against the provision of Rs. 125 crores and Rs. 136 crores for purchase and distribution of fertilisers and other inputs during 1978—79 and 1979—80 respectively, the provision was enhanced to Rs. 200.00 crores for 1980—81 so as to afford relief to various States affected by aberrant weather.

Pesticides. Pesticides are as necessary for crops as fertilisers. While this is true of all crops, the high yielding varieties seem to be more vulnerable to pests than native varieties. The reason is not clear, except that the HYVs are more succulent than other varieties and therefore more attractive to pests. It is commonly seen that pests prefer healthy plants to weaklings. The HYVs fattened on fertilisers naturally attract more pests.

In fact, the relationship between fertilisers and pesticides appears to have developed into a vicious circle. More fertilisers, more pesticides. Pests sap the strength of the plants. So, more fertilisers are applied as pickups. When plants get back health, pests come on again and the eternal round continues. However, what is economically significant here is that farmers have to invest as heavily in pesticides as they do in fertilisers. This adds materially to the cost of cultivation. Latterly, prices of pesticides have been mounting faster than the prices of fertilisers. They have now become an unbearably heavy item in the farmer's budget.

133. ANIMAL HUSBANDRY

Beginnings of Animal Husbandry. Animal husbandry developed in India from very early days. The bull was sacred to the Indus Valley people. The water buffalo was known in Harappa, long before it appeared anywhere else in the world. Ancient India also appears to have been the original home of poultry. Most ornithologists are agreed that all domestic species of poultry have descended from the Indian wild fowl. The cow became important, with the arrival of the Aryans, who worshipped it. *Krishna Leela* or Sree Krishna's sport with the *Gopis* (milk-maids) highlights the esteem extended to dairying in ancient India. Radha, the beautiful consort of Krishna, was herself a milkmaid.

A Ritual. It is the religious associations of the cow and the bull that have kept alive animal husbandry in India through the centuries. It is ironic that this religious reverence for animals has not helped the poor cattle, in any way. On the contrary, it has bred communal riots and political agitations.

Today, animal husbandry in India is a traditional duty—a ritual. This is why India possesses the largest cattle population in the world and shows the lowest output of milk. Many cattle are ill-nourished and sick. But religious inhibitions obstruct even the sterilisation of the unfit—let alone the painless killing of sick animals.

Table 129

Livestock Population in India 1977 Livestock Census

	(In millions)
Cattle	179.4
Buffaloes	61.7
Goats	75.9
Sheep	40.8
Pigs	7.7
Others	2.2
Total	368.7

Source: 1977 Livestock Census.

Cattle. State-wise, the largest number of cattle are found in UP, followed by Madhya Pradesh, Bihar, Maharashtra, Rajasthan, Andhra Pradesh, West Bengal, T. Nadu, Orissa, Mysore, Gujarat, Assam and Pubjab.

Important Breeds of Cattle. Although the majority of Indian cattle are nondescript there are 26 well-defined breeds, distributed all over the country.

Table 130

	Name	*State*	*Type*
1	Amritamahal	Karntaka	Draught breed/cows, poor milkers
2	Bachuar	Bihar	—do—
3	Bargur	T. Nadu	—do—
4	Dengi	Maharashtra	—do—
5	Deoni	AP	—do—
6	Gaolao	MP	—do—
7	Gir	Gujarat	Draught and milch breed
8	Hallikar	Karnataka	Draught breed/cows poor milkers
9	Haryana	Haryana Delhi	Draught & milch breed/cows excellent milkers
10	Kangayam	T. Nadu	Draught breed/ cows poor milkers
11	Kankrej	Rajasthan Gujarat	Draught and milch breed
12	Kenkatha	UP	Draught breed/cows poor milkers
13	Kherigarh	UP	—do—
14	Khillari	Maharashtra	—do—
15	Krishna Valley	Maharashtra	Draught and milch breed
16	Malvi	AP Rajasthan	Draught breed/ cows poor milkers
17	Mewati (Kosi)	UP	Draught and milch breed
18	Nagore	Rajasthan	Draught breed/cows poor milkers
19	Nimari	Gujarat	—do—
20	Ongole	Nellore-AP	Draught and milch breed
21	Ponwar	UP	Draught breed/cows poor milkers
22	Rath	Rajasthan	Draught and milch breed
23	Sindhi Red	(Original home) W. Pakistan	Draught and milch breed/ cows excellent milkers
24	Sahiwal	—do—	Milch breed/cows good milkers
25	Siri	W. Bengal, Sikkim, Bhutan	A mountain breed excellent for draught/ unfit for the plains
26	Tharparkar	(Original home) W. Pakistan	Draught and milch breed

Buffaloes. Buffaloes, unlike cattle, are mainly bred for milk. Bulls, even though they are hardy and strong, are hardly used as draught animals. The better known breeds of buffaloes are six in number.

(1) *Jaffarabadi* are bred in the Gir forest (Gujarat) round about Jaffarabad. These yield 15 to 20 kg of milk per day. (2) *Mehsna* breed comes from Baroda (Gujarat) and Neighbouring areas. These animals are of medium size. They are valued for their early maturity, persistency in milk-yield and regularity in breeding. (3) *Murrah* buffaloes are found in the Punjab, Haryana and Delhi. Individual milk yields range from 25 to 30 kg per day. (4) *Nagpuri (Ellichpuri)* buffaloes are found mainly in MP: Their daily average yield is 6 to 8 kg milk. (5) *Nili* buffaloes comes from Montgomery district of W. Pakistan and Ferozpore district of Punjab. The males of the species are put to draught. The average milk yield is 1700 kg in a lactation period of 250 days. (6) *Surti* breed has its home in Kaira and Baroda districts, Gujarat. The average lactation yield is between 1700 and 2000 kg.

Development Schemes. Cattle and buffalo development schemes play a crucial role in rural reconstruction. They provide gainful employment to small and marginal farmers, landless labourers and others living below the poverty line. In addition, cattle and buffaloes supply power for agricultural operations, and transport and energy in the form of biogas. Higher productivity is the basic object of all cattle and buffalo development schemes.

Central Cattle Breeding Farms. Seven Central Cattle Breeding Farms, two each for cattle and buffalo breeds of national importance and three for exotic dairy breeds, have been established as under:

Table 131

Central Cattle Breeding Farms

Location	*Year of Commencement*	*Cattle Breed*	*Present* herd strength*
Suratgarh (Rajasthan)	1967	Tharparkar	944
Dhamrod (Gujarat)	1968	Surti Buffalo	765
Chiplima (Orissa)	1968	Red Sindhi	559
Koraput (Orissa)	1972	Exotic Jersey	67
Avadi (Tamil Nadu)	1973	Murrah Buffalo	724
Andeshnagar (UP)	1976	Exotic Holstein Friesian	47
Hessarghatta (Karnataka)	1975	Exotic Holstein Friesian	226

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* As in 1980—81

The CCBFs are large in size with acreage ranging between 1100—1500 acres each and the farm, when fully developed, would have a herd strength of around 900 each. The main objective of the farms is to establish a breeding herd of 300 females and 30 breeding bulls of each breed for conducting the scientific breeding programme of progeny testing, with a view to obtaining proven and pedigreed bulls of superior quality for selective breeding.

Cattle development projects including establishment of exotic herds at selected cattle breeding farms for producing high quality exotic bulls as well as high yielding fodder production programmes, taken up with foreign assistance from Australia, Switzerland and Canada were in operation during the year. Elite herds of Holstein Friesian, Jersey and Brown—Swiss breeds were being built up for production of bulls of high genetic merit.

Herd Registration Scheme. Herd registration based on milk recording is essential for improvement of cattle and buffaloes on scientific lines. Under the scheme, Herd Books for well established 11 breeds of cattle and buffaloes had been opened covering 7 indigenous cattle breeds (Gir, Haryana, Kankerej, Ongole, Sahiwal, Red Sindhi and Tharparkar), 2 exotic cattle breeds (Holstein-Friesian and Jersey) and 2 breeds of buffaloes (Murrah and Surti). Animals, located at breeding farms and in the breeding tracts, phenotypically true to prescribed breed characteristics and production standards, were registered. This scheme is helpful in locating superior germ-plasm and high yielding cattle for further improvement.

Four field units set up at Rohtak (Haryana), Ahmedabad (Gujarat), Ongole (Andhra Pradesh) and Ajmer (Rajasthan) operate in the home tracts of the indigenous breeds in Haryana, UP., Delhi, Gujarat, Maharashtra, Rajasthan and Andhra Pradesh. Nearly 110 milk recording centres of the scheme were in functioning during 1980.

Central Frozen Semen Bank, established at Hessarghatta, in Bangalore produces frozen semen of high quality bulls of Holstein-Freisian, Jersey, and Red Dane from among foreign breeds and from indigenous breeds such as Red Sindhi, Tharparkar and Murrah breed (buffaloes). Eight frozen semen stations were also set up with assistance from Danish government in the States of Punjab, Haryana, Madhya Pradesh, Uttar Pradesh, Karnataka, Andhra Pradesh, Bihar and Orissa.

Sheep. Sheep rearing is especially suited to drought prone areas and is one of the main projects of the DPAP Programme. India stands sixth in sheep population in the world but produces hardly 1.1 percent of the total wool production. This is because Indian sheep are poor producers of wool, perhaps the poorest in the world It is estimated that in 1980 India had a sheep population of about 40 million which produced around 34 million kg of wool. This wool is of inferior quality and is suitable only for carpet manufacture

Sheep development programme mainly concentrates on improving the quality and quantity of wool, through crossbreeding. With this objective in view, 841 exotic sheep (521 Rambouillets and 320 Russian Merinos) were imported during the year 1980—81. These sheep are being used in J & K, Himachal Pradesh, U.P. and Rajasthan for upgrading the local sheep population in these States.

Central Sheep Breeding Farm, Hissar. The Central Sheep Breeding Farm, Hissar, was set up in 1969 with the object of producing and supplying, pure Corriedale rams and cross-bred rams to various States for sheep development programmes. During the last 10 years about 2900 pure-bred and cross-bred rams were distributed by the farm. During 1980—81, 506 pure Corriedale and cross-bred rams were supplied to different States for cross-breeding with indigenous ewes.

Goats. India stands first in the world in point of goat population. The goat is proverbially the poor man's cow. It is hardy and cheap to maintain. It provides a variety of commercially useful articles. Goat's milk is wholesome and nourishing and is considered specially suitable for infants and invalids. Goat's meat is preferred by many people to beef and mutton. Goat skins are in great demand as leather for gloves and shoes. The intestines of goats are used to make *catgut*.

There are several distinct breeds of goats in India. The well-known breeds are *Kashmiri, Gaddi, Chamba, Pashmira, Jamnapuri, Beetal, Marwari, Osmanabadi, Barbari, Malabari and Bengali*.

Foreign Breeds. The main foreign breeds imported into India to improve the indigenous stock are *Togganbarg, Alpine, Anglo-Nubian* and *Saanen*, all good milk-yielders. Another important foreign breed is *Angora*. These goats are well known for the production of *mohair*, which is a valuable raw material used in the production of superior woollen cloth.

Piggery Development. With the adoption of improved pig rearing practices, which include quality stock, provision of balanced feed, health cover, marketing and credit facilities, pig farming has become a commercial venture. Pig rearing also provides a vast scope for the economic betterment of Scheduled Castes, Scheduled Tribes, marginal farmers, small farmers and agricultural labourers.

To encourage scientific pig breeding in the State Pig Breeding Farms and also in the farms maintained by the Agricultural Universities, exotic pigs were imported for breeding purposes. There are 77 Regional Pig Breeding Farms and State Pig Breeding Farms which maintain pure breeds of pigs (Large White Yorkshire, Landrace, Hampshire, Middle White Yorkshire, Saddle Back, Berkshire, Temeworth, Charmukha and Large Black) as well as crosses of different types of pigs. The total strength of breeding stock at these farms was about 500 boars and 4000 sows with an estimated production of 40,000 quality pigs per year for supply to pig breeding.

Poultry. Indian poultry includes several kinds of birds like domestic fowls, ducks, geese, turkeys and guinea fowls. Domestic fowls dominate. Ducks are also fairly common. Other varieties are bred more for fancy than for profit.

State-wise, Andhra Pradesh has the largest number of poultry, followed by Bihar, West Bengal, Tamil Nadu and other States. By and large, indigenous domestic fowls are poor layers though they are ideal mothers, good sitters and excellent foragers.

Foreign breeds like White Leghorn, Rhode Island Red, Black Minorca etc. were brought into India many years ago. They have cross-bred with local varieties and have produced a species that are better layers than their predecessors. However, exotic breeds are themselves being bred pure in many poultry firms.

Poultry industry in India is fairly young. It has developed only during the last 15 or 20 years. During this period annual egg production has increased from 2800 million eggs in 1963 to over 12,000 million eggs by the end of 1979. The broiler production has also shot up to more than 25 million in this interval.

Central Poultry Breeding Farm at Bangalore has evolved a genetically superior strain designated "HH 260". This bird meets the requirements of our farmers as it is capable of laying up to 260 eggs in 12 months of lay and has low feed consumption, early maturity and lower mortality.

Four private hatcheries and eight government farms are multiplying this strain and distributing hybrid chicks to poultry farmers all over India.

Ducks raised in India are for the most part of the egg—laying type. Among the indigenous breeds, the most important are the *Sylet Mete* found in the villages in Eastern India and the *Nageswari* found in the Surma valley of Assam and Bangladesh. The improved breeds are the *Indian Runner* and *Khaki Campbell*. None of these varieties are bred pure. The average

Indian duck is a mixture of different breeds

India has approximately 16 million ducks representing 18 per cent of the domesticated duck population of the world. Tamil Nadu and Bengal account for more than 75 per cent of ducks in India. The average annual egg production of Indian ducks is 90 to 100

In 1980 a comprehensive Duck Development Programme on scientific lines was worked out for the entire country. Rearing of Japanese quails is also being attempted.

134. OPERATION FLOOD

Though India had about 352 million cows in 1976* the total production of milk in India worked out to an average of about 157 kg milk per animal per year. This is very low compared to 4154 kg in USA, 3950 kg in UK, and 3902 kg in Denmark. The Indian buffalo does much better with 504 kg per year but even this is only one–seventh of what it is in some advanced countries.

Per capita availability of milk in India, according to Dr. V. Kurian, Chairman of the National Dairy Development Board, was 137 gm daily in 1940, when such an estimate was first made. It declined continuously to reach 108 gm in 1970. Thereafter, availability has increased to 118 gm per day in 1977 and further to 122 in 1979. Even this record is dismally low compared to the world situation which itself had been steadily deteoriorating. In 1970 while the average world availability was 288 gm, Indian supply stood at 108 gm.

India was thus perennially short of milk. To make matters worse, what little milk the country produced was disposed of in the most haphazard manner. This affected the producer and the consumer adversely. The only workable solution to this problem was commercial dairying. Operation Flood Project was therefore conceived as the foundation for a big dairy industry in India which would increase and stabilise milk production and also provide a steady supply of milk or milk products at reasonable prices.

Whenever a shortage or dislocation of milk supply occurred, the worst sufferers were the urban families. In view of this, the four metropolitan cities of India Bombay, Calcutta, Delhi and Madras— were selected as the first targets of Operation Flood.

The Operation Flood Project is entirely based on food aid from the World Food Programme (WFP) which is expected to cost 153 million dollars. The WFP has offered India 126,000 tonnes of skimmed milk powder (SMP) and 42,000 tonnes of butter oil (BO) as a grant. It was understood that through the sales of these commodities Rs. 116.4 cr. would be generated and deployed for the Operation Flood project.

The Indian Dairy Corporation (IDC) was set up as a government company in 1970 under the Indian Companies Act. The Corporation was entrusted with the administration of Operation Flood projects, that is to say, with the milk marketing and dairy development project under the World Food Programme.

National Dairy Development Board, which was constituted in September, 1965 under the Societies Registration Act, 1860, was to assist the IDC in all technical matters.

Operation Flood I. Operation Flood I was launched in July 1970 with the aid from the World Food Programme (WFP) in terms of skimmed milk powder (SMP) and butter oil (BO) to bring about a real breakthrough in milk production so as to free the rural population from the grip of poverty. Initially introduced as a Five-Year Project (1970–75), it was finally concluded on March 31, 1981, after 11 years.

The immediate objective in launching Operation Flood I was to secure a commanding share of the liquid milk market in the four metropolitan cities of Bombay, Calcutta, Delhi and Madras and to stabilise the supply and consumption of milk in these cities. This object has largely been achieved.

As regards the more substantive long term objecive of increasing national milk production and supply, OP I has not made much headway. The organised production and procurement of milk under this scheme is only 80 lakh litres (production) and 30 lakh litres (procurement) per day as against an All India targeted daily milk production of 810 lakh litres originally programmed for 1979–80.

Nevertheless, much has been achieved. The total milk production of the country stood at 30 million tonnes (1979–80) which shows an increase of 9 million tonnes over the preproject level (1970) of 21 million tonnes. This increased per capita milk consumption from 110 gm per day in 1969 to 122 gm in 1979–80.

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* FAO estimate

In processing milk for supply to the four metropolitan cities, the project has achieved its target of 29 lakh litres per day. Financially, the project has been a success too. Against an amount of Rs. 112.7 cr. generated through the sale of donated commodities till 31 October, 1980, the total expenditure under the project was Rs. 112.2 cr.*

Milk Products. The consumption of liquid milk in India is very poor, hardly 40% of the total milk supply. The balance of 60% is converted into various milk products like ghee, dahi, butter and others. Ghee by itself claims around 33% of the aggregate milk supply. Apart from their direct consumption, these products are used to manufacture high-priced items.

Sweets apart, the other milk products are milk powder, processed food such as baby food, beverages, cheese and butter. The production of milk products in 1979-80 was estimated at 32,600 tonnes of milk powder, 35,000 tonnes of baby milk powder, 22,500 tonnes of malted milk powder, 5600 tonnes of condensed milk and 930 tonnes of cheese. The total production of all varieties of milk powder was 68,100 tonnes in 1979–80 as against 59,530 tonnes in the preceding year.

Prices. A disturbing trend in urban milk supply is the rising prices. Between 1970 and 1980 the price of milk has nearly trebled itself.

Table 132

Index Number of Wholesale Prices Milk & Milk Products

Base 1970-71=100

Year	*Index*
1971-72	102.3
1972-73	108.6
1973-74	133.4
1974-75	152.9
1975-76	162.1
1976-77	154.0
1977-78	157.0
1978-79	165.4
1979-80	171.2
1980-81	181.0

Part of this price rise can be attributed to inflation but the better part is accounted for by heavy overheads, transport charges and intermediary profit. One report goes so far as to say "There are numerous intermediaries between the producing centres and the consuming centres who make urban consumers to pay through their noses, while the poor farmer is deprived of the price rise."

Operation Flood II. The Operation Flood II was launched in July 1978 envisaging the generation of funds to the tune of Rs. 485 crores against Rs. 116 crores during Operation Flood I. During the 7–year period between 1978 and 1985, larger quantities of SMP and BO of the order of 1.86 lakh tonnes and 0.76 lakh tonnes respectively are to be imported from EEC directly as against 1.22 lakh tonnes and 0.42 lakh tonnes imported during the first phase. The funds generated from donated commodities will be Rs. 235 crores in the second phase.

According to the plan for the generation of these funds the amount from the gift commodities should have been Rs. 53 crores upto end of March 1980 but actually it was even less than half at Rs. 22 crores. This is because of the lesser receipts from the imported commodities. During the first year of the Operation Flood II against a schedule of 30,000 tonnes of SMP and 15,000 tonnes of BO only 7000 tonnes and 3000 tonnes respectively were obtained. Till end of March 1980 receipt of SMP was 35172 tonnes and that of BO was 14255 tonnes.

The project envisages an increase in milk production to 38 million tonnes by 1984–85 from the level of 30 million tonnes in 1979–80, thereby increasing per capita availability from the current level of 126 gm per day to 144 gm per day in 1984–85. It is further expected to rise to 185 gm per day by 1988–89.

Apart from the existing four metropolitan markets, the scheme proposes to reach 148 cities with population above 1 lakh. This means more dairy equipment and investments in plants and machinery over and above the existing capacities.

The project in its second phase plans to reach 10 million rural milk producers in 33990 organised societies by 1984–85 against just 1.5 million farmers in 5630 societies at present. With the artificial insemination programme the population of cross breed cows and upgraded buffaloes is estimated to rise to 14 million, forming the so-called 'national milch herd' in rural milksheds.

A national milk grid linking 25 cluster milk sheds of 155 districts is expected to link all the 148 cities for milk distribution. The project covers 19 states in its second phase as against 10 states during the first phase.

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* Ministry of Agriculture, Report 1980–81.

Production & Processing. India has about 17% of the total stock of cows in the world and around 50% of buffaloes. Of the total stock of cattle and buffaloes in India (estimated at 240 million), 82 million are milch animals—54 million cows and 28 million buffaloes. But the 28 million buffaloes give more milk than the 54 million cows.

Currently (1981) there are 190 dairy plants in the country, including 94 liquid milk plants, 30 milk product factories and 66 pilot/rural dairy centres in operation—both public sector and cooperative sector—with a throughput of 62 lakh litres daily. 57 other plants are in the process of construction or expansion.

Skewed Development. Operation Flood I & II concentrate on urban areas, on the assumption that the villages will tag on to the neighbouring towns and thus develop themselves. This is a dubious assumption.

Already imbalances of a different kind are visible as between States. These imbalances will also be accentuated.

Table 133

Livestock Products

		1978-79	79-80	80-61	81-82
Milk	million tonnes	29.1	30.2	31.5	32.9
Eggs	million Nos.	112,85	12,320	12,587	13,521
Wool	million KGs.	33.0	34.0	35.0	36.0
Meat	Lakh tonnes	7.5	8.2	8.9	9.6

135. FISHERIES

The marine fish resources of India are vast. With the Arabian Sea to the west and the Bay of Bengal to the east, both merging into the Indian Ocean at Cape Comorin (Kanyakumari), the Indian coastline stretches for 6100 km. The continental shelf lying along the coast has a total area of about 259,000 sq. km. Beyond the continental shelf, lie the oceanic waters, home of large sharks and rays and bony fishes like the tuna, the sail fish and the sword fish.

Indian inland fishing grounds are also extensive. The total inland fish resources covering both capture and culture fisheries comprise 29,000 km of riverine waters, 3 million hectares of reservoirs, 1.50 million ha. of tanks and ponds and 1.4 million ha. of estuaries or backwaters.

Inland Fisheries. Capture fisheries are confined to riverine, reservoir and estuarine waters and account for 90 per cent of India's inland fish catch. This is a source that has been so intensively fished for many years that it is practically depleted. In future, India has to depend upon culture fishing to develop its inland fisheries.

Culture fisheries or fish farming has been practised in north eastern and central India for centuries, particularly in the States of West Bengal, Orissa, Bihar, Uttar Pradesh and Madhya Pradesh. These States contributed practically all (98%) the culture fish produced in India. The main species farmed are *katla, rohu* and *mrigal,* all major Indian *carps*. About 500,000 households are now engaged in fish farming. These farms are small, less than 1 ha. The average annual yield from these farms is also poor but varies greatly from State to State—from 140 kg, the poorest, in UP to 480 kg, the highest, in West Bengal. All these farms call for extension and/or scientific breeding techniques to improve production.

The sole source of carp seed—spawn, fry or fingerlings—is the natural habitats like rivers. These sources are not only limited in quantity but also poor in quality. Indian scientists have now evolved techniques to produce in simple hatcheries, large quantities of high quality carp seed, which can form the foundation for large scale fish farming in India.

The first organisd attempt in this direction was made by the government in 1976. It has now materialised into a World Bank—aided project to develop fish farming in the States, where it is already practised, namely West Bengal, Bihar, Orissa, UP and MP. The project initially is to cover 58 districts out of a total of 154 districts in these States. The World Bank would provide $ 20 million out of an estimated total of $ 40.8 million. It is expected that this project would increase fish farm production in these States from 100,000 tonnes in 1976 to 300,000 tonnes in 1986.

Embanked Fisheries. The estuarine waters can be and are used for breeding some varieties like prawns. This is done by bunding shallow estuarine areas. The flow of water into these embanked areas is controlled through sluices. This arrangement facilitates taking two crops from the same field—an agricultural crop usually rice and a fish crop, usually prawns. These agricultural-cum-fish farms are found in Bengal and Kerala. The embanked fields, when not under cultivation, are filled with fresh or saline water through the sluices. The fresh water or saline water, as the case may be, brings with it a lot of fish fry which grow up in these protected areas and are caught, when they reach marketable sizes. Once the fish crop is taken the fields are brought under cultivation.

AFC Scheme. Experts of the Agricultural Finance Corporation (AFC) have worked out a viable small farm (1 ha.) fish-cum-paddy scheme which can easily be extended to bigger farms. This is an improvement on the traditional embanked fishery and much more productive. It involves the construction of perimeter canals around paddy fields and using the excavated earth to form dykes for protection of canals against submergence and consequent loss of fish during monsoons. The AFC experts have suggested culture of air breathing fish like *clarius* or *anabas* in addition to *carp*. The advantage of this scheme is that it can be worked successfully wherever paddy is cultivated on a large scale, say, Andhra Pradesh or Tamil Nadu. The scheme, if extended to all paddy cultivating areas, will not only help farmers to double their income but also provide enough fish for internal consumption.

Marine Fisheries. Marine fisheries account for the lion's share of Indian fish landings. More than 200 species of fish figure in India's marine catch, of which the more important are: oil sardine, Indian mackerel, Bombay ducks, ribbon fish, jew fish, pomfrets, Indian salmon, seer fish, soles, tunas and shellfish, including oysters, crabs, lobsters, shrimps and prawns.

Marine fishing grounds are divided into *in-shore* (up to a depth of 10 fathoms), *off-shore* (between 10 and 40 fathoms) and *deep sea* (beyond a depth of 40 fathoms). India's fishing fleet are also divided into 3 groups, traditional and nonmechanised country craft, mechanised fishing boats and trawlers. Presently (1981), country crafts number around 2.2 lakhs, mechanised boats about 14,000 and trawlers 100.*

Out of an estimated marine potential of 14 million tonnes, the country's actual catch is only around 10 per cent and about 2 per cent of the world output of 72 million tonnes. The contribution of deep sea fishing to the total catch is very poor amounting at best to 5 per cent while country crafts account for well over 60 per cent and mechanised boats, a little over 30 per cent.

Fish Consumption. Fish forms a major item of food only in the coastal areas and the eastern states, especially in Bengal. In other places it is at best a supplementary food item. Nutritionally this is an unwholesome trend. An Indian on an average eats only 4.13 kg of fish per annum, which is about 1/3 of the minimum per capita nutritional requirement. The nutritional deficiency appears to be appalling in comparison with other countries where the per capita consumption is much higher—15 kg in USA, 21 kg in UK and 41 kg in Japan.

Exclusive Economic Zone (EEZ). In 1977 India declared a 200—mile marine area around her territories as an Exclusive Economic Zone (EEZ). In this zone India has the exclusive right to exploit all natural resources—which, of course, include fish.

India's EEZ has an expanse of 2.02 million sq. km which though barely 2.8 per cent of the surface area of the Indian Ocean accounts for a substantial 31 per cent or 4.47 million tonnes of total potential yield of the entire Indian Ocean.

The fish wealth of the Indian Ocean is estimated to be 14.39 million tonnes, of which only 20% or 2.88 million tonnes is being exploited. Though the Indian exclusive zone is richer than other areas of the Indian Ocean in fish wealth, the Indian Ocean itself is supposed to be very poor in fish compared to the temperate waters of the Atlantic and the Pacific. This is one reason why the total catch of fish which some of the western nations make is very much greater than what India gets.

Unlike the EEZ of the western advanced countries, Indian EEZ has a very little volume of fish in vast deeper waters. Thus, barely 11 per cent of the total potential yield is spread over 80 per cent of total area beyond 100 fathoms depth. Moreover, in the absence of scientific research on location of fishing grounds for commercial exploitation and their economic feasibility, deep sea fishing at this stage along the lines practised in the advanced countries would prove uneconomic.

On the other hand, shallow waters upto the depth of 100 fathoms (a mere 20 per cent of total surface area of Indian EEZ) are estimated to account for about 89 per cent of total potential fish yield. Almost all of 3.21 lakh tonnes of potential shrimp resources is believed to be confined within 40 fathoms. Thus almost everything that can be fished economically lies within 100 fathoms.

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* One estimate puts the number of country crafts at 192,000 and the mechanised fleet at 16,500.

India's deep-sea waters, however, are rich in tuna. According to F.A.O., tuna catch can go up to 250,000 tonnes per year. At present, this fishery is controlled by Japan, Thailand and South Korea.

Tuna has a well developed international market which India can enter easily. At present tuna fishing is restricted to areas around Lakshadweep and the Andaman and Nicobar Islands. It can be extended to the entire west coast and part of the east coast.

In-Shore Fishing. The major portion of fish landings (over 65 per cent of the total catch) comes from the in-shore waters. The off-shore and deep sea waters are practically untapped. This means that the in-shore waters are being overfished and might soon be depleted. So it is essential that India should turn to offshore and deep sea for increasing its output.

Off-Shore & Deep Sea Fishing. Both off-shore and deep sea fishing were beyond the ken of Indian fishermen who followed the traditional way of fishing in small country craft. India started on expanding its offshore fishing with the help of Norwegian experts. The Indo-Norwegian project with headquarters in Quilon (Kerala) and Veravel (Gujarat) has been providing necessary training to Indian fishermen and equipping them with mechanised boats and modern fishing gear

In 1968 India launched its first deep sea fishing scheme. Under this scheme, import of trawlers and participation of big business houses in fishing operations were permitted. The entry of big houses and the import of trawlers were and still are strongly opposed by the traditional fishing communities because their livelihood is being threatened by trawlers operating in shore waters. The trawlers in their turn were compelled to fish inshore because they had no idea of fishing centres in off-shore and deep sea waters and their crew were not skilled enough to operate in deeper waters.

The net result has been that there was far too much noise but little change in the production pattern

Fishing Harbours. Fishing harbours at the major ports of Cochin, Visakhapatanam and Calcutta are already in operation. Harbours are being constructed at the ports of Madras, Bombay and Paradeep. Several minor ports have also constructed their own harbours—Tuticorin (Tamil Nadu), Karwar (Karnataka), Vizhinjom (Kerala), Bhomra (Orissa) and Phoenix Bay (Andamans) are already working. Several other minor ports are also planning fishing harbours.

Production & Export. In 1979—80 fish production was estimated at 23.43 million tonnes, of which 14.95 lakh tonnes were from the sea and 8.45 lakh tonnes from inland waters. In 1980—81, production is expected to increase to 25 million tonnes—16 lakhs marine and 9 lakhs inland. During April to November 1980 India exported 46,923 tonnes of marine products valued at Rs. 144.09 cr. Only about 8% of the fish production was exported, the remaining 92% was consumed within the country.

Pearl Fishery. The traditional site for pearl-fishing in India is the Gulf of Mannar on the east coast. T. Nadu Government has encouraged the revival of pearl-fishery in this area. Pearl-fishing is controlled by government, two-thirds of the catch being taken up as government share. The window pane oysters whose shells are used for decoration are found in the open sea off Coromandal coast, Madras coast and Cochin coast.

Fish Products. The most important fish product is fish oil extracted from sardines. This oil is used in the manufacture of paints, for softening hides and tempering steel. Shark liver oil is an excellent substitute for cod liver oil. Some Indian fish like jew fish and catfish yield isinglass valuable in the clarification of wines. Bombay, Madras and Calcutta are the main centres of trade in this commodity. Other products are fish scrap converted into poultry feed and fish waste converted into manure. Dried fish, cured by wet and dry processes used to be the main export item till the fifties. Frozen fish has now replaced dried fish in the export market

Table 134

Fish Production

		78-79	*79-80*	*80-81*
Marine	Lakh tonnes	14.9	14.9	15.5
Inland	,,	8.2	8.5	8.7
Total	,,	23.1	23.4	24.2

136. FORESTS

Forestry, like agriculture, is a State subject and the State Governments administer the forests. But the Union Government exercises a supervisory control. It has its own department under an Inspector-General of Forests in India.

Scientific Forestry. The practice of scientific forestry in India may be said to have begun when Sir Dietrich Brandis took over as Inspector-General of Forests, India, in 1864. It was at his instance that the Government decided to adopt a scientific policy for forests. On the advice of Dr. Voelcker, a German expert, the Government of India issued a resolution dated 19th October, 1864 declaring a Forest Act Policy. In 1865, the Indian Forest Act was passed.

Under this Act the Indian forests were surveyed and classified as *reserved* and *protected*. In the reserved forests, the existing rights were settled, transferred or commuted, while in the protected forests they were recorded and regulated. To put it otherwise, in a reserved forest, everything was an offence that was *not permitted* while in a protected forest, nothing was an offence that was *not prohibited*.

The forest policy declared by the Government laid down the broad principles under which forests of different types were to be administered. Successful implementation of this excellent forest policy resulted in a steady development of the forests in the country. For nearly 60 years, forests were continuously conserved. There was some depletion of the forest capital during the First World War, but this did not affect the growth and accumulation of forest capital. But in World War II forests were heavily felled far beyond their sustained production.

National Forest Policy. When India became independent, the forest policy of 1894 was revised in the light of later experience and a National Forest Policy was promulgated in 1952.

The National Forest Policy resolution proposed that the area under forests be steadily raised to 33.3 per cent of the total land area, the proportion to be aimed at being 60 per cent in the hilly areas and 20 per cent in the plains.

In the years that have elapsed since the National Forest Policy was declared two important developments have taken place side by side that have a significant bearing on forestry. The rapid growth of population had increased the demand for a large variety of forest products, firewood for example, and at the same time had led to the occupation of more forest lands for diverse purposes. Between 1952 and 1973 about 34 lakh hectares of forest land were occupied for such purposes as cultivation, river valley projects, industrial estates etc. In Dec. 1973 the National Development Council decided that no further de-forestation is to be allowed for expansion of cultivation and that in order to compensate for the land already lost suitable wastelands should be afforested.

The Forest (Conservation) Act of 1980 embodies the resolution of the National Development Council. The Act ordains that notwithstanding anything contained in any other law for the time being in force in a State, no State Government or other authority shall make except with the prior approval of the Central Government any order directing (i) that any reserve forest or any portion thereof shall cease to be reserved, (ii) that any forest land or any portion thereof may be used for any non-forest purpose.

According to the Union Minister for Agriculture, more than 4 million hectares of forest land have been deforested in the last 30 years. The new Act is expected to put a stop to similar encroachments in future (Press Report).

Forest Area. India's total forest area is 75.06 million hectares which is 22.88 per cent of the total geographical area of the country. The per capita forest area works out to 0.11 hectare which is extremely low. India's forest area constitutes 1.85 per cent of the world forest area (4057 million hectares) whereas the population forms 15.64 per cent of the world population (4335 million).

Ownership. The state owns the greatest forest area, around 71.17 million ha. Corporate bodies account for about 2.48 million ha. and private individuals, the rest.

It will be seen that only Assam, H. Pradesh, Meghalaya, Orissa, A and N Islands, Arunachal Pradesh and Tripura exceed the national norm of 33.3 per cent laid down in the Forest Policy. Kerala, Goa, Daman and Diu and Manipur and Maharashtra maintain plus 20 per cent forest of their respective land areas. All the other States and U. Territories have low percentages of forest land and need urgent reforestation.

Table 135

Forests in India—State-wise

(In hectares)

States/ Union Territory	*Geographical area (as on 1-7-1971)*	*Forest area 1966-67*	*Percentage of forest area to geographical area*
AP	27675	6651	24.0
Assam	9662	3808	38.2
Bihar	17388	3085	17.7
Gujarat	19599	1940	9.9
Haryana	4422	136	3.1
H. Pradesh	5567	2165	38.7
J & K	22224	2081	9.4
Karnataka	19177	3520	18.4
Kerala	3886	1041	26.8
MP	44284	17299	39.1
Manipur	2236	602	26.9
Meghalaya	2248	757	33.7
Maharashtra	30776	6686	21.7
Nagaland	1653	310	18.8
Orissa	15584	6816	43.7
Punjab	5036	188	3.7
Rajasthan	34222	3764	11.0
T. Nadu	13007	2218	17.1
Tripura	1048	633	60.4
UP	29441	4571	15.5
W. Bengal	8785	1183	13.5
A and N Islands	829	635	76.6
Arunachal Pradesh	8358	5154	61.7
Chandigarh	11	...	...
D and N Haveli	49	...	...
Delhi	149	5	3.4
Goa, Daman and Diu	381	103	27.0
Lakshadweep	3	...	...
Mizoram†	...	...	...
Pondicherry	48	...	...
All India*	328048*	75351	23.3

† Included in Assam

* Included 8411 thousand hectares, the area under illegal occupation of Pakistan & China. One hectare is equivalent to 2.471 acres.

Source: Eastern Economist, March 31, 1972.

Botanical Divisions. Indian forests fall into five botanical types: (1) Evergreen (2) Deciduous (3) Dry (4) Hill (5) Tidal or Littoral.

Evergreen forests are found where the rainfall is 80'' to 120'', i.e. the Western Ghats and the sub-Himalayan regions in the east. Hard wood such as teak, ebony, rosewood and iron wood are found in this area. Bamboos of all varieties thrive well here.

Deciduous forests or monsoon forests are seen in areas where the rainfall ranges from 60'' to 80''. These forests occupy the larger part of the Deccan plateau. The trees are big and provide fine timber—teak, sal, padauk, sandalwood, redwood, arjun etc.

Dry forests occur where rainfall is between 30'' and 40''. The desert regions of Rajasthan and South Punjab are such places. The plants here have thick and fleshy stems and leaves, and the forests mostly consist of thickets of shrubs with a few stunted trees.

Hill forests are found in South India above 5000 ft. and in the Himalayas above 3000 ft. elevation. The trees are evergreen and include the very best timber like oak, picea, deodar, pines, chestnut, walnut, maple, elm, ash and birches; laurels, poplars and rhododendrons also grow profusely here.

Littoral forests are found in the estuaries of great rivers like the Indus, the Ganges and the Mahanadi. The trees here provide excellent firewood and constitute a rich source of fuel.

Forest Development Programmes. Forest development programmes stress what are called *productive forestry* and *social forestry.* Production forestry concentrates on raising man-made forests to meet the long time requirements of forest products in general and materials for wood-based industries in particular.

The Central Government has taken the lead in establishing State Forest Development Corporations, with central participation. These corporations are to be financially assisted by term lending institutions in India and wherever possible by World Bank and its associates. The corporations are expected to take up massive operations. The Bastar project of the Madhya Pradesh Forest Development Corporation is typical. The project is estimated to cost 8.2 million dollars, in which the World Bank assistance would be 1.95 million dollars. The project is revolutionary in concept. It aims at destroying the sal forests in Bastar and replacing them with pine plantations which would form the feed base for future paper mills.

In 1980–81, 26 projects have been formulated for foreign aid, out of which 7 projects have already been approved for international aid of 11.4 million dollars. If the other projects now in pipeline are approved, foreign investments in Indian forestry would amount to a mammoth 200 million dollars.

Social forestry aims at augmenting fuel wood resources and minor wood for farmers by new plantations of fuel wood trees and small trees suitable for farm needs.

Minor Forest produce. All forest produce other than wood are considered minor forest produce. These include bamboos and canes, grasses of various kinds, leaves of different trees, medicinal plants, gum, resin and lac.

Bamboo. The most important and plentiful plant among minor forest products is the ubiquitous bamboo, Bamboo is seen in many varieties from the giant bamboo of the Assam forests to the puny dwarfs of the dry Deccan forests. The two main types are male bamboo and thorny bamboo.

Thorny bamboo flowers gregariously in about 30 to 40 years and dies. Once the entire bamboos die out after flowering, it takes some years for fresh bamboo clumps to appear.

The flowering of the male bamboo is regarded as a portent of famine all over India. Actually, in north-eastern India the flowering is often followed by famines. The connection between the two is obscure. It is presumed that rodents feed on the profusion of bamboo seeds on the ground (both in public forests and in private lands) and multiply. The greatly increased rodent population eats up the cereal grains. This causes a food shortage, which may lead to famine, unless prompt remedial measures are adopted.

Leaves of certain forest trees are of commercial value. Leaves of the climber *Mahul* can be used as cups and plates and are commercially disposed of as such. The *kendu* leaf is by and large the most important forest leaf. This is used as wrappers for beedis and are in great demand all over India. All states where kendu plant grows count upon them as a major source of income. Kendu trees are found in plenty in Madhya Pradesh and Orissa, who are the major producers of this product.

Gums are used as mucilage for sizing in confectionary or as medicines. The most important gum-yielding trees are *Babul, Bijasal, Kulu, Salat* and *Dhaora*. Of these the gum called *Kareya* from Kulu trees is used for mixing with ice-creams to thicken them. It is exported and brings in valuable foreign exchange.

Resins differ from gums in that they are soluble in alcohol. The most important resin in India is that of *Chir*. The tree is tapped in the Punjab, Himachal Pradesh and UP. The pines yield turpentine, which is now being extracted on a commercial scale.

Katha Industry. Katha is an astringent substance obtained from a species of plant called *Acacia Catechu* locally known as *Khair*. *Katha* is valued as a medicine for digestive troubles. It is also used as an ingredient in paint. *Cutch* which is a by-product of katha is an excellent tanning material

About 3000 tons of katha are produced annually in India. The leading States are UP, MP and Bihar.

Medicinal Plants. There are over 20000 species of medicinal plants of proven therapeutic value in the Indian forests. They are collected and used as drugs and medicines under the Indian medical system.

137. SHIPPING

National Maritime Day. In 1965, April 5 was declared the National Maritime Day. This commemorates the maiden voyage of the 5934—ton ship, LOYALTY owned by the Scindia Steam Navigation Company on April 5, 1919. The Scindias may thus be regarded as the pioneers of modern Indian shipping.

Progress of Indian Shipping. 1919-1939. The progress of Indian shipping between 1919 and 1939 was slow and confined to certain narrow groves. Indian shippers dared not expand beyond the confines of the sub-continental coastal waters.

The main sub-continental coastal cargo runs were four: (i) between India and Burma, (ii) between the West Coast of the sub-continent and the East coast which included Sri Lanka ports, (iii) on the West coast of the sub-continent extending from Colombo to Karachi and (iv) between Calcutta and South Indian ports on the East coast of the Indian peninsula.

During this period unberthed passenger trade was complimentary to carriage of cargo. This trade was combined simultaneously with carriage of cargo through the operation of cargo-cum-passenger vessels.

During the war period, i.e., 1939 to 1945, much of the shipping activities of Indian owners came to a halt. Most of their big and small cargo and cargo-cum-passenger vessels were requisitioned for war effort. There were only skeleton cargo and passenger services on the Indian coast maintained by steamers. Sailing vessels were mobilised to fill the gap wherever possible to keep the coastal cargo for civilian use moving.

In August 1947 India had only a meagre fleet of 59 ships of nearly 2 lakh GRT. By 1977, the Indian fleet had crossed the 5 million GRT mark and reached 5.5 million gross tonnes during 1978. During this period the Indian fleet not only renovated itself but also diversified extensively.

1980–81. During the decade ending 1980, the Indian fleet was increased by 137 per cent in terms of gross registered tonnes. The gross addition to the fleet during the 10 years totalled over 4 million tonnes, but after accounting for deletions, the net addition was of 3.2 million GRT.

Table 136

Indian Tonnage

The position of Indian tonnage as on 31-12-1981 as compared to 31-12-1980, is shown below:—

	Coastal		*Overseas*		*Total*	
	No. of Ships	*G.R.T.*	*No. of Ships*	*G.R.T.*	*No. of Ships*	*G.R.T.*
1. Net Opertive tonnage as on 31-12-80	58	2,53,586	325	54,25,850	383	56,79,436
2. Tonnage added from 1-1-81 to 31-12-81	10	62,366	15	1,76,283	25	2,38,649
3. Tonnage removed from 31-12-81	1	8,307	4	21,033	5	29,340
4. Tonnage transferred from coastal to overseas during 1-1-81 to 31-12-81	(–) 2	(–) 7,425	(+) 2	(+) 7,425	...	...
5. Net Operative tonnage as on 31-12-81.	65	3,00,220	338	55,88,525	403	58,88,745

National Shipping Share. Indian merchant navy has been steadily increasing its share in Indian shipping. In 1951 Indian Coastal Conference was established mainly to protect Indian coastal shipping. This helped Indian ships to achieve a near monopoly in coastal shipping. In overseas trade the Indian fleet has increased its share from a mere 6.5 per cent to 41.45 per cent in 1980–81.

Indian Register of Ships. The Indian Register of Shipping, an Indian Classification Society, was inaugurated at Bombay in April 1975. The first Register Book of the Society was released in 1976.

Shipping Development Fund Committee (SDFC) has been of great help to Indian shippers. It gives assistance in the form of Rupee loans at the low rate of 4½ per cent interest with fairly long periods of repayment. Latterly the Committee has started assistance from foreign exchange reserves for acquiring ships from abroad. Also it undertakes guarantee. Up to 31-12-80 foreign exchange loans amounted to Rs. 494.87 cr. The total tonnage added with SDFC assistance up to Dec. 1980 was 5.27 million Gross Registered Tonnage.

Shipping Companies. The *Shipping Corporation of India* (S C I) is the towering giant of Indian shipping. This is a public sector concern which came into being on Oct. 2, 1961 with the amalgamation of Eastern and Western Shipping Corporations. It has an authorised capital of Rs. 35 crores and a paid up capital of Rs 27.95 crores. The Jayanti Shipping Co. was made a subsidiary of the Shipping Corporation in 1971. It was amalgamated with the SCI on January 1, 1972.

In 1981 SCI had a fleet of 145 ships aggregating to 29.24 lakh GRT. It owns the largest merchant vessel in India—*Kanchenjunga*.

The only other public sector company is the *Mogul Line Ltd.* This company was originally established in Bombay in 1877 under the name *"Bombay & Persia Steam Navigation Co. Ltd."* It is thus the oldest shipping company in India. It passed into the public sector when the government of India acquired 92 per cent of the company's stock in 1960. In 1980 the Mogul Line operated 17 vessels with 203,659 GRT. Till recently, the company was mainly engaged in Haj pilgrim traffic. Today it has diversified and operates a cargo-cum-passenger service to the Gulf area, an overseas tramp service and coastal shipping, both cargo and passenger.

The largest shipping company in the private sector is the *Scindia Steam Navigation Co. Ltd. S.S. Loyalty*, a Scindia vessel, was the first Indian ship to undertake an India – UK service (April 5, 1919). The Scindias were also the first Indian concern to start a shipyard in 1941. This shipyard at Visakhapatanam has since been taken over by the Govt. of India and is now known as the Hindustan Shipyard.

There are 60 other private shipping companies. The private sector as a whole owns a tonnage of 2.54 million GRT or about 44.78 per cent of the total tonnage of 5.68 million GRT in the country as against 55.22 per cent owned by the public sector companies.

Ports. India has a coastline of over 5700 kilometres studded with a large number of ports, big and small, distributed more or less evenly on the two sea-boards. They have been our main gateways to the outside world and have decisively influenced the religious, cultural, politcal and commercial fortunes of the country.

At the time of independence India had only 5 major ports. Today, there are 10. They are: *Calcutta, Paradeep, Visakhapatanam, Madras* and (New) *Tuticorin* on the East Coast and *Kandla, Bombay, Mormugao,* (New) *Mangalore* and *Cochin* on the West Coast. The (New) Mangalore port was inaugurated by the Prime Minister on Jan. 11, 1975. The (New) Tuticorin Port was declared a major port in July, 1975.

Major ports. The ten major ports in the country are the direct responsibility of the Government of India. The Indian Ports Act, 1908 provides the statutory authority for management, while the Major Port Trusts Act, 1963 contains the statutory provisions for the constitution of port authorities. Out of these ten major ports, five are on the Eastern coast (Calcutta/Haldia, Paradeep, Visakhapatanam, Madras and Tuticorin) and five are on the Western coast (Kandla, Bombay, Mormugao, New Mangalore and Cochin). In 7 of these major ports (Bombay, Calcutta, Cochin, Kandla, Madras, Mormugao and Visakhapatnam), there are Dock Labour Boards which are statutory tripartite bodies set up under the Dock Workers (Regulation of employment) Act, 1948. They ensure greater regularity of employment by regulating the employment of dock workers in these ports.

Kandla.* When India lost Karachi after partition, there was no major port to serve the 1000-mile coastline between Bombay and Karachi. Therefore, Kandla, in Gujarat, was declared a major port in 1955. The port was completed in 1957.

Bombay. Situated almost midway on the west coast of India, Bombay is a natural deep water harbour. The harbour covers some 75 sq. miles and provides a safe shelter for ships in all seasons. It is now the biggest port in India. The three major docks at Bombay port are: Alexandra Dock, Victoria Dock and Princess Dock.

Mormugao, in the Union Territory of Goa, is one of the finest natural ports in India. Though a natural harbour it is less spacious than Bombay.

Mangalore, situated between Mormugao and Cochin, is the major port for the State of Karnataka.

Cochin lies on the west coast in Kerala, some 200 miles north of Cape Comorin, the southernmost tip of India. Rightly called the Queen of the Arabian Sea, it is one of the finest natural harbours in the East. It covers an area of 130 sq. miles of sheltered backwater and provides a calm harbourage for all vessels even in the worst monsoon weather.

Tuticorin lying almost at the tip of the Indian Peninsula is the southernmost port on the east coast.

Madras. Situated on the east coast, Madras is the third biggest port in India. It is an artificial port.

Visakhapatanam, on the east coast, lies between Madras and Calcutta. India's first ship-building yard was established here.

Paradeep, a newly opened port in Orissa on the east coast of India, was declared a major port in April 1966.

Calcutta is the second biggest port in India and is situated on the Hooghly River, some 90 miles from the Bay of Bengal. On account of its location in estuarine Hooghly Calcutta is completely dependent on tides. Ships can enter and clear only at fixed hours according to the tides. Calcutta has two main docks—Kidderpore Dock and King George's Dock.

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* The ports are listed in the geographical order from the northernmost point on the Arabian seaboard on the west to the northernmost point on the Bay of Bengal coast on the east.

Intermediate and Minor Ports. The Indian coastline is also served by a large number of intermediate and minor ports (about 225 of which 160 are working ports) which together handle a coastal and overseas traffic of about 90 lakh tonnes per annum. The administration of these ports is the responsibility of the State Government concerned.

Intermediate ports are distributed among States and Territories as follows:

Karnataka: Karwar, and 19 minor ports.

Tamil Nadu: Cuddalore, Nagapattanam, and 7 minor ports.

Maharashtra: Ratnagiri and Redi and 46 minor ports.

Gujarat: Okha, Porbandar, Bhavanagar, Navalakshmi, Bedi, Veraval, Broach Mandir, Sikka and Surat and 40 minor ports.

Kerala: Alleppey, Neendakara and Kozhikode and 10 minor ports.

Orissa: One minor port only.

Andhra Pradesh: Masulipatanam and Kakinada and 5 minor ports.

Pondicherry: One minor port only.

Andaman and Nicobar Islands: 15 minor ports only.

Table 137
Ports Statistics

Major Port	*Year*	*Total (tonnes)*	*No. of ships entered*
Bombay	1979-80	166,19,093	2843
	1980-81	175,70,528	3307
	1981-82	132,88,144	2530
Calcutta including Haldia	1979-80	85,55,000	905
	1980-81	92,90,000	1045
	1981-82*	70,38,000	811
Cochin	1979-80	54,64,551	867
	1980-81	52,33,525	788
	1981-82	42,23,585	671
Kandla	1979-80	72,72,892	422
	1980-81	88,16,282	484
	1981-82	69,59,442	427
Madras	1979-80	99,85,255	1024
	1980-81	103,74,740	1143
	1981-82*	86,91,558	962
Mormugao	1979-80	145,05,237	579
	1980-81	139,53,467	565
	1981-82	88,41,031	339
New Mangalore	1979-80	9,01,513	245
	1980-81	9,62,085	227
	1981-82	12,72,194	186
Paradip	1979-80	23,06,364	139
	1980-81	22,93,602	149
	1981-82	14,81,216	80
Tuticorin	1979-80	24,11,314	245
	1980-81	25,63,118	360
	1981-82*	19,36,085	276
Visakhapatnam	1979-80	102,29,461	564
	1980-81	102,60,819	563
	1981-82	77,02,877	401
Total for all Major Ports	1979-80	782,50,680	7833
	1980-81	813,18,166	8631
	1981-82	614,34,132	6683

* Provisional

Source: Ministry of Shipping & Transport, Report 1981—82.

Ship Building. Ports, shipping, shipbuilding, ship repairing and marine equipment manufacturing constitute the maritime sector of the economy. The maritime sector has to progress as one unit. Any development of one section at the expense of another would spell disaster for all component units.

As of today, there are 4 major shipbuilding units in the country—*Garden Reach Shipbuilders and Engineers* (GRSE) of Calcutta, *Hindustan Shipyard* of Visakhapatanam, *Cochin Shipyard* of Cochin and *Mazagon Dock* of Bombay. All these units are in the public sector.

Garden Reach is now capable of building vessels upto 26000 DWT. Hitherto, the yard was mainly building minor naval vessels and harbour craft like tugs and dredgers.

Cochin Shipyard is now engaged in the production of Panamax Bulk Carriers of 75,000 DWT. The Building Dock and Repair Dock, which are the biggest in India, can accommodate vessels of 85,000 & 100,000 DWT respectively.

Cochin Shipyard has built two merchant vessels in 1981, *Rani Padmini* (July 1981) for the Shipping Corporation of India and *Ratnadeep* (Dec. 1981) for Ratnagar Shipping Company. Both ships are 75,000 DWT. While *Rani Padmini* was taken delivery of by SCI in July 1981, *Ratnadeep has to remain within the precincts of the yard for a few months for outboard fittings and furnishings.*

The *Mazagon Dock* which was initially a repair yard has now specialised in building warships. However, of late its spare capacity is being utilised to build merchant vessels also. Creation of additional facilities are being planned to undertake construction of ships upto 25,000 DWT.

Hindustan Shipyard is the pioneer shipbuilding yard of the country. The yard is capable of building all types of vessels upto 30,000 DWT and drydocking/repairing vessels upto 70,000 DWT.

138. RAILWAYS

The Indian Railway system is the biggest in Asia and the fourth biggest in the world. It is also the biggest public sector enterprise in India, with an investment of over Rs. 6700 cr. (1980) and a gross annual revenue of over Rs 2400 cr. (1980).

Evolution of the Indian Railways. The first railway in India as also in Asia was opened by the Great Indian Peninsular Railway Company (now the Central Railway) formed in England. The company took up the survey in 1850. In about 3 years the work was completed and the first train steamed out of Bombay on April 16, 1853. The train ran from Bombay to Thana—a distance of about 33 km. A new chapter in the history of India was thus opened.

The development of Indian railways owes much to Lord Dalhousie who became the Governor General of India in 1848. It was he who suggested a system of trunk lines connecting the hinterland of Bombay, Bengal and Madras Presidencies with their principal ports and with each other. But the Government had neither the funds nor the technical personnel to undertake the work. So the work was entrusted to private companies who were guaranteed a return of 5 per cent on their capital for a period of 25 years and free land needed for the railway. In return the companies were expected to share their surplus profits with the government and to sell the railway to the government after 25 years.

But the expected profits failed to materialise and the guaranteed interest continued to be a drain on government resources. So the Government purchased the railways on the expiry of the period of the contract, though the companies continued in management. Following the recommendations of the Ackworth Committee the Government took over the management of the bulk of the railways in 1922.

The 1920's were a period of expansion for the railways. New lines were taken up. In 1925 electric traction was introduced. The first electric railway was opened on February 5, 1925 from Victoria Terminus (Bombay) to Kurla. Then followed bad days for the railways with the depression of the 30's and the Second World War. The partition of India in 1947 made matters worse

Partition. The partition left India with 54,151 km of railway line while Pakistan got 11,066 km. What came as India's share was distributed among Provinces and 500 and odd Princely States. It was, in fact, a ramshackle railway organisation shared by 42 different units of varying sizes, some of them managed by the Government of India, some by Princely States and some by private companies. The old Princely State of Sangli, for instance, owned a mere 7 km of railway, while the Nizam of Hyderabad managed 2335 km. With the accession of the Indian States to the Union of India, 10,672 km of railways, belonging to different Princely States, were integrated with the government railways in 1950

New lines. During the last 30 years since 1950-51, 7644 kilometres of new lines have been added to the network, double and multiple lines provided on 7913 kilometres of route length, 4951 route kilometres electrified and 1543 route kilometres converted from metre gauge to broad gauge.

Administration. The Indian Railways network is owned and managed by the Central Government. The operations are controlled and directed by the Railway Board under the overall supervision of the Minister for Railways. The Board has five members including the Chairman. The Chairman is Ex-Officio Principal Secretary, and each of the other four Members an ex-Officio Secretary to the Government of India. The Board thus performs the dual functions of a secretariat to the Ministry of Railways and that of an executive body responsible for railway operations. The Railways' annual budget is approved by Parliament and accounts are audited by the Comptroller and Auditor General of India.

Administrative Divisions. The railway net-work is divided into nine Zonal Railways, each headed by a General Manager. The Zonal Railways are organised on the divisional pattern. The nine Zonal Railways with the route kilometres traversed by them are given below:

Table 138

Zonal Divisions

Railway	*Headquarters*	*Route kilometres*
Central	Bombay	6684
Eastern	Calcutta	4202

Northern	New Delhi	10,853
North Eastern	Gorakhpur	5113
Northeast Frontier	Maligaon (Gauhati)	3628
Southern	Madras	6629
South Central	Secunderabad	6478
South Eastern	Calcutta	7007
Western	Bombay	10,339
	Total	60,933

In addition there are three Production Units, viz. the Chittaranjan Locomotive Works, Chittaranjan, Integral Coach Factory, Perambur (Madras) and Diesel Locomotive Works, Varanasi, each under the charge of a General Manager engaged in the manufacture of rolling stock. In addition, a Wheels and Axles Plant being set up at Bangalore under the charge of a General Manager is expected to commence production of wheels & axles by the latter half of 1982. There is also a Research, Designs and Standards Organisation at Lucknow which is an attached office of the Railway Board and is headed by a Director General.

Table 139

Gaugewise analysis. Of the three gauges on the Indian Railways, Broad Gauge is the most predominant as shown in the table below:-

Route km. (as on 31-3-1981)

Gauge	Total	Single line			Double/Multiple lines		
		Electrified	Other	Total	Electrified	Other	Total
Broad 1.676 m	31,827	748	18,456	19,204	4,430	8,193	12,623
Metre 1,000 m	25,167	138	24,612	24,750	29	388	417
Narrow 0.762 m 0.610 m	4.246	—	4,246	4.246	—	—	—
Total	61 240	886	47 314	48 200	4 459	8.581	13 040

Although Broad Gauge forms only 52 per cent of the total route kilometres, it accounts for 87.1 per cent of the freight tonne km and about 78.6 per cent of the passenger km. Metre Gauge covering about 41 per cent of the total route km. carries only 12.7 per cent of the freight tonne km and 20.7 per cent of the passenger km. Narrow Gauge comprising about 7 per cent of the total network accounts for the residual 0.2 per cent of the freight tonne km and 0.7 per cent of the passenger km.

Traction. Till the early fifties, steam locomotion held complete sway on the traction scene of the Indian Railways so much so that about 99 per cent of the freight traffic and 93 per cent of the passenger traffic were handled by steam locomotives alone. However, electrification and dieselisation came in the latter half of the fifties and because of their better traffic potential, they have pushed the conventional steam locomotion to be used on relatively less important sections and services. Now 79 per cent of freight traffic and 49 per cent of the passenger traffic (train km) are being hauled by diesel and electric traction.

Electrification & Dieselisation. Electric traction was first introduced in 1925 on a small section of the Bombay area and till 1957 was confined to less than 400 km in the suburban sections of Bombay and Madras. Diesel traction was introduced in 1957.

Diesel and electric locomotives are comparatively more efficient than steam locomotives. They provide greater hauling capacity, have sharper acceleration and deceleration and are capable of higher speeds. They have less servicing needs and, therefore, their availability for traffic is comparatively more. Thus dieselisation and electrification lead to considerable saving of line capacity. Electric traction is, however, the most capital intensive mode of traction because of the heavy investment involved in laying down the overhead equipment and, therefore, requires a certain minimum level of traffic density for its economic use. Steam traction becomes less and less economical on sections with high traffic density or places situated away from the coal fields.

Locos. The power fleet of the Indian Railways, as on March 31, 1982 comprised 7469 steam, 2403 diesel and 1036 electric engines.

Steam locomotives reached a peak in 1963-64 with 10,810 units. Since then it has declined gradually coming down to 7856 in 1979-80. Production of steam locos was stopped in 1971 but because of heavy investment involved in replacing all steam locos by diesel and electric locos, steam locos will be retained in service till the expiry of their codal life. More steam locomotives have, however, been relegated to comparatively less important services.

Coaches. As in March 1980, passenger coaches numbered over 18 thousand with a seating capacity of more than 15 lakhs on the Broad Gauge, and over 10 thousand coaches with seating capacity of over 6 lakhs on the Metre Gauge while Narrow Gauge had about 1300 coaches with a seating capacity of around 40 thousand.

Coaching vehicles have not increased in proportion to the increase in passenger traffic. While the number of passengers had gone up by 193 per cent since 1950, passenger coaches have increased only by 119 per cent. So there is much overcrowding on the main lines and suburban services.

Goods Wagons. The wagon fleet on the Indian Railways totalled 400,946 as on 31st March, 1981.

Railway Finances. At first, railway finances were included in the budget of the Government of India. In 1924 they were separated from general finance by a resolution of the Central Legislature. Under the separation convention the railways are required to pay a dividend at a fixed rate on their capital, the whole of which was advanced by the Government of India. The rate of dividend payable as well as other financial matters are determined periodically by Parliament. Accordingly the Parliamentary Committees have fixed dues of the railway in 1949, 1954, 1960, 1965, 1971 and in 1973. The rate of dividend payable rose from 4 per cent in 1950-51 to 4½ per cent from April 1, 1963.

In 1973 the railways were called upon to pay a dividend at the rate of 5½ per cent on all capital invested up to March 1964 and 6 per cent on all capital investments thereafter. The Railway Convention Committee constituted in 1977 raised the dividend payable to the General Revenues for 1978-79 and increased the provision to the pension fund.

Deferred Dividend Liability. According to the recommendations of the Railway Convention Committee, 1977, from 1st April, 1978 no loan is to be taken from the General Revenues for augmenting the Revenue Reserve Fund for dividend equalisation and the payment of dividend to General Revenues is to be restricted to the net revenue available with the Railways. The difference between the net revenue and the dividend actually due to the General Revenue, is to be carried forward as 'Deferred Dividend Liability' for payment out of the future surplus of the Railways.

During the year 1979-80, the net revenue available being Rs. 227.29 crores and the dividend payable to the General Revenue amounting to Rs. 293.53 crores, the difference of Rs. 66.24 crores was carried over as 'Deferred Dividend Liability' for payment out of the future surplus.

The cumulative amount of loans taken from the General Revenues for augmenting the Revenue Reserve Fund for dividend equalisation upto 1977-78, (initially assessed at Rs. 122.19 crores as on 31st March, 1978) stood at Rs. 115.18 crores on 31st March, 1980.

On 31st March, 1980, the Railways owed to the General Revenues, a sum of Rs. 76.39 crores on account of deferred dividend payment on new lines, which is in the nature of a contingent liability.

1980-81 Earnings. The gross traffic receipts of the Indian Railways for the year 1980-81 amounted to Rs. 2624.02 crores. After meeting working expenses of Rs. 2536.46 crores, the net traffic receipts for the year came to Rs. 87.56 crores.

During 1980-81, the amount of dividend due to be paid to General Revenues amounted to Rs. 325.36 crores and the dividend actually paid was Rs. 127.49 crores, which represented the "Net Revenue" available with Railways. The balance amount of Rs. 197.87 crores has been carried forward as Deferred Dividend Liability.

Handicaps to Railway Revenues

The Railways suffer from serious handicaps which erode its revenue on three counts. 1. Ticketless Travel, 2. Uneconomic Lines and 3. Social burdens

1. **Ticketless Travel.** The revenue from passenger traffic can be augmented significantly through containing the evil of ticketless travelling. The concerted efforts made, particularly during the emergency, in this regard, undoubtedly, yielded beneficial results. But even then the evil remained quite widespread. This is evident from the fact that surprise checks in 1979-80 trapped 37.89 lakh passengers, who paid a total of Rs. 4.67 cr. as penal fares. In 1978-79, a similar check brought in Rs. 4.28 cr.

2. **Uneconomic Lines.** Railway officials have identified 132 km branch lines as uneconomic. These lines cover Broad Gauge (22 km), Metre Gauge (76 km) and Narrow Gauge (34 km)sections. They are being maintained under political pressures. The State governments insist that they should be run, regardless of costs. Loss on this account has been estimated at Rs. 26.14 cr. for 1974-75, 25.75 cr. for 1975-76, 20 cr. for 1976-77 and 27 cr. for 1979-80. (Estimate for 1977-78 is not available.)

3. **Social Costs** mostly comprise concessional passenger and freight rates. These are equitably justifiable in as much as the beneficiaries of these concessions are the weaker sections of society. Losses estimated for 1980-81 on this account are Rs. 331.76 cr. as under: loss on coaching services Rs. 227.45 cr., on low rated commodities Rs. 104.8 cr., and on freight concessions Rs. 13 lakhs.

Box 51

Goods Freight Below Target

The growth rate of freight traffic moved by Indian Railways was conspicuously lower at 5.1 per cent during April-September 1982 against 16.2 per cent recorded in the first half of 1980-81. The railways moved 109.65 million tonnes in terms of originating traffic in the first half of 1982-83. This was 1.66 per cent short of the April-September target of 111.50 million tonnes.

Economic Times Nov. 29, 1982.

139. ROADS & WATERWAYS

Evolution of Road Policy. Little attention had been paid to road development in India till the 1920's. This was mainly because the Government of India concentrated its attention on railways in preference to roads. After the First World War, however, motor transport increased considerably and the paucity and the inadequacy of Indian roads were felt all over India. In 1927, the Council of State adopted a resolution for the improvement of the road system and a Road Development Committee under Dr. M. R. Jayakar was set up. The Committee reported that road development (then a Provincial subject) was beyond the capacity of the Provincial governments and that considering the national importance of raods, the Central Government ought to bear a substantial portion of the costs.

In pursuance of this recommendation the Central Road Fund was formed. The formation of the Fund marks a turning point in the history of road development in India. For, in a few years' time, it became the major source of funds for road-building in the country.

Central Road Fund. The Central Road Fund was constituted in 1929 as a non-lapsing fund. It derived its revenue from the proceeds of customs and excise duties levied on motor spirit, at the rate of 2½ annas per gallon (3.5 paise per litre). Twenty per cent of this income is credited to the Central Road Fund (Ordinary). Eighty per cent is to be distributed among States and Union Territories on the basis of the volume of motor spirit consumed in the State or Territory. The Central Road Fund (Ordinary) Reserve is utilised for the administration of the Fund, for research schemes and special investigation approved by the Government of India.

Table 140

CENTRAL ROAD FUND 1980-81

(Rs. in lakhs)

A. Appropriation to the fund upto 1980-81	18991.38
B. Allocation of receipts	
1. Credits to the Central Road Fund reserve*	
(a) Balance carried forward on 15-8-1947 from the old fund	89.53
(b) In respect of additional duty on motor spirit . .	2043.80
(c) Other receipts . . .	1266.02
	3399.35
2. Central Road Fund Allocation for expenditure to state	11559.28
Total allocation of receipts (1&2)	14958.63

C. Actual allocation	
(i) From ordinary Reserve	2073.70+ 15.35
(ii) From Allocation . . .	14009.43
(iii) From special Reserve	1030.06
Total Allotments (i)+(ii)+(iii)	17128.54
D. Balance (A—1C)	1862.84

* Covers both Central Road Rund (Ordinary) Reserve and, Central Road Fund (Special) Reserve.

Source: *Report, Ministry oı Shipping & Transport, 1981-82*

The total length of roads in the country during the last three years ending 31-3-81 was as under:-

Table 141

	Road Length	*Estimated*	
	31-3-1979	31-3-1980	31-3-1981
(1) Total road length (Revised in lakh Km)	14.29	15.03	15.74
(a) Surfaced roads	5.89	6.17	6.39
(b) Unsurfaced roads	8.40	8.86	9.35

The total length of National Highways covered by this net work is 31,358 kilometres.

Growth of Traffic. Due to development in various sectors of the economy, traffic on our roads has been increasing at a rapid rate, both in volume and weight. Between 1951 and 1978, the goods traffic by road has increased from 5500 million tonne-kilometre to 77000 million tonne-kilometre, marking a 1400 per cent growth. Similarly, passenger traffic has increased from a mere 23000 million passenger-kilometre to 250,000 million passenger-kilometre during the same period thus marking a 10-fold increase.

National Highways. Within the framework of the road system, predominant role is played by the National Highways, which are the main arteries running through the length and breadth of the country connecting State capitals, major ports, industrial complexes, etc. They complement the existing and planned rail network and waterway facilities accommodating at the same time sea-port and airport development as well as the mining, industrial and agricultural traffic arising out of the rural development process.

Expenditure aggregating about Rs.978 crores has been incurred on development (original) works of National Highways System from the inception in 1947 upto 31-1-81.

The Inter-State Transport Commission is a statutory body set up in March 1958 under Section 63(A) of the Motor Vehicles Act 1939 for developing, co-cordinating and regulating the operation of transport vehicles in inter-state regions or areas. The Commission has formulated five zonal permit schemes for the North, West, South, East and Central Zones for free movement of a limited number of public carriers on all national and state highways within the zone, on payment of road tax at a single point and without countersignature of permits.

Transport Development Council is a national level advisory body to recommend policy measures in regard to road transport. The Council has the Minister of Shipping and Transport as its Chairman and Transport and PWD Ministers of the State Governments as its members. It normally meets once a year.

Development Schemes

Nagpur Plan. In December 1943 the chief engineers of the various States met at Nagpur and evolved an all-India road plan. On the basis that no well-developed agricultural area should be more than 5 miles from a metalled road, the chief engineers suggested that the road mileage should be increased from 220,000 to 331,000 of which 123,000 miles would be metalled. This plan, known as the Nagpur Plan, formed the basis for future development plans.

Types of Roads. Roads, under the Nagpur Plan, were classified as (1) National highways (2) State highways (3) Major district roads (4) Minor district roads and village roads.

National highways connect capitals, ports and important towns and form the main lines of communication in the country. Roads of strategic importance for defence are also included in national highways.

State Highways are trunk roads interlinking State capitals with important towns in the States and with the national highways.

District roads connect the headquarters of the districts with important areas in the district and intersect National and State highways or railways passing through the district.

Minor district roads and village roads connect different villages one to another and to the nearest district road or inland waterway.

Twenty-Year Road Plan

By the end of the Second Plan, (1961), the target of road mileage envisaged in the Nagpur Plan had been realised for the country as a whole, although progress as between individual States and regions was by no means even and large tracts still lagged behind. Towards the end of the Second Plan, chief engineers from the Centre and States met together to formulate a new twenty-year road development plan for the period 1961-81. The Plan proceeded on the basis that in a developed agricultural area, no village should remain more than 6.4 km from a metalled road , or more than 2.4 km from any type of road. In working out specific proposals, factors such as area, population, regional levels of development and development needs and possibilities were to be taken into consideration. In view of the fact that an average of 16 km road length for 100 sq. km was achieved under the Second Plan, the Twenty-year Plan envisaged an average road length of 32 km for 100 sq. km by 1981. The cost of completing the programme was estimated at Rs. 5200 crores of which Rs. 630 crores were for village roads.

Border Roads Organisation. The Border Roads Organisation was set up in 1960 with a view to providing communications in the sparsely developed North and North Eastern regions of the country in order to speed up their socio-economic development. The Organisation has since expanded and is now functioning in underdeveloped and remote regions of our border States. It is perhaps the largest single departmental undertaking for the construction of roads anywhere and is self-sufficient in manpower, machinery and equipment and is known for its efficiency and speed of execution. In all, 12878 km of roads are being maintained by Border Roads Organisation presently.

The Border Roads Organisation has constructed the world's highest road from Manali in Himachal Pradesh to Leh in Kashmir. The average altitude of the terrain is 4270 metres and the road negotiates four passes at heights ranging from 4875 to 5458 metres. The Organisation is now constructing another road which will, on completion, become the world's highest road negotiating heights up to 5639 metres.

National Permit Scheme. The Government of India introduced in 1975 a 'National Permit Scheme' to facilitate inter-State movement of vehicles. Permits under the Scheme are granted by the Authorities appointed by the State Governments or Union Territory Administrations. The quota of permits for each State is fixed on the basis of truck population with weightage of 50 permits to the hilly States of Assam, Himachal Pradesh and J & K as these do not have adequate railway facilities. Initially, when the scheme was introduced in 1975, the overall ceiling of permits for the entire country was 5300. The ceiling was raised to 8300 in 1979.

Nationalisation of Transport. Nationalisation of passenger road transport was undertaken after independence primarily to provide more and better facilities to the passengers. Barring Goa, Daman and Diu and Pondicherry, most of the States and Union Territories have nationalised passenger traffic in varying degrees. In the country as a whole, 52.6 per cent buses were being run by the public sector undertakings as on 31 March 1977. Statutory Corporations have been set up under the Road Transport Corporations Act 1950 in several states. In other states, the nationalised services are operated by departmental or municipal corporations or registered companies. In most of the big cities, bus services are state-owned.

Goods transport continues to be almost exclusively in the private sector except in certain areas.

Inland Waterways

Inland waterways provide the cheapest form of transport in India. They played a prominent part in Indian transport till the end of the 19th century. The expansion of the railway and the advent of motor transport, however, reduced the importance of water transport. Still, in certain parts of India, notably W. Bengal and Kerala, water transport continues to be important even today.

The length of navigable waterways in India is about 14,000 km of which 3500 km are navigable by steamers. Important among them are the Ganga, the Brahmaputra and their tributaries, the Godavari, the Krishna and their canals, the backwaters of the West Coast, the Canals of Kerala, the Buckingham Canals in AP and T. Nadu, the Delta Canal in Orissa and the Mandovi and the Zurai in Goa.

The Central Inland Water Transport Board, New Delhi, formulates policy for the development of inland water transport in the country. The Inland Water Transport Directorate of the Union Ministry of Shipping and Transport gives technical advice to the States which are responsible for the development of inland waterways.

The States of Andhra Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Uttar Pradesh and West Bengal and the Union Territory of Goa, Daman and Diu have set up inland water transport organisations to formulate and work out inland water transport schemes.

National Waterway is a new concept that has come up with the completion of Farakka Barrage in 1981. The Farakka Barrage has facilitated an all weather waterway with adequate depth for mechanised craft, all the way from Farakka to Calcutta (Haldia), along the stretch of the Ganga-Bhagirathi-Hooghly river system. Investigations are being conducted to see if a Farakka-Allahabad waterway is feasible. If this is possible a long waterway all the way from Allahabad to Calcutta can be put into operation.

Central Inland Water Corporation. The Corporation continued to run cargo river services between Haldia/Calcutta, Bangladesh and Assam and river-cum-road service from Haldia/Calcutta to Tripura. The other major activities of the Corporation include dredging in the river Bhagirathi on behalf of the Calcutta Port Trust, undertaking ship repairs, management of Pandu and Jogighopa ports on behalf of the Ministry of Shipping and Transport.

140. AVIATION

Growth of Aviation. India took the first steps in aviation as far back as 1911. In that year, demonstration flights were made in India for the first time. Among these, the most remarkable was the flight by M. Picquet, a Frenchman. He carried mail from Allahabad to Naini, a distance of some 10 km. This was the first air mail service in the world.

But it was only in January 1920 that organised air transport began in India. This service was opened with two RAF planes and carried mail from Karachi to Bombay. In 1927, the Civil Aviation Department was formed, aerodromes were built and flying clubs were started. In 1929 a weekly service was opened between UK and India by the Imperial Airways. The service took seven days to reach India and vice versa as against three weeks by ship.

The overseas (UK-India) service was extended from Karachi to Delhi. In 1932 Indian National Airways Ltd. opened a service from Karachi to Madras and Tata Airways Ltd. one from Karachi to Lahore. These companies carried mail on behalf of the P&T Department which levied an air-mail surcharge. In 1937 the Empire Air Mail Scheme was introduced. Under this scheme letter-mails between Empire Countries were to be carried without any surcharge.

The commencement of the World War in 1939 upset all air services. The empire Air Mail Scheme was suspended and the Indian aviation companies had to operate their services for government and defence purposes.

From 1945, air passenger and flight traffic increased steadily and as many as 11 aviation companies were formed in India.

In 1946, Air Transport Licensing Board was constituted with the object of licensing scheduled air transport services. In 1949, night air mail services were opened between the four principal cities of India—Delhi, Calcutta, Bombay and Madras. A limited number of passengers and freight were also carried on these services. The "All-up" air-mail scheme introduced in 1949 removed the air-mail surcharge.

But air services were soon in trouble. Operationally they fared well but as the operation costs were mounting, they ran into financial losses. Considering the deteriorating position of the air companies and the importance of air navigation for India, the Government stepped in and nationalised the air services.

Air Corporation Act, 1953. Under this Act, two corporations were set up—Air India International and Indian Airlines.

The operation of all air services was entrusted to these two corporations. Air-India was to handle all international services. Indian Airlines was to carry on all domestic services, including services to neighbouring countries of Afghanistan, Nepal, Burma and Sri Lanka. The director General of Civil Aviation is responsible for all regulatory functions of civil aviation and for providing the necessary infra-structure for civil transport operations.

Vayudoot. A third air company Vayudoot Pvt Ltd. was set up in April 1981 for operating air services initially in West Bengal and North Eastern States/Union Territories. The company has been registered under the Companies Act as a joint venture of Air India and Indian Airlines with equal Equity participation. The authorised capital of the company is Rs. 25 crores. The headquarters of the company is in Delhi but its operational headquarters is at oresent in Gauhati.

The main object of the company is "to plan, promote, develop, organise and operate air transport services, scheduled and non-scheduled, for the carriage of passengers, mail and freight and for any other purpose, including aerial work."

Air-India

Air India fleet. The fleet of the Corporation now consists of seven Boeing 707s and ten 747 aircraft making a total of 17 aircraft. During 1981/82, there will not be any addition to the present fleet.

Financial Results. 1. During the financial year 1980/81, the Corporation earned a marginal Operating Profit Rs. 0.33 crore and incurred a Net Loss of Rs. 21.30 crores.

The Corporation has earned an estimated net profit of around Rs. 3.51 crores during the period April/September 1981. The revenue has gone up substantially to the tune of Rs. 289.62 cr. showing a growth of 18.24 per cent over previous year in the same period. Due to intensive sales efforts and as a result of various economy measures undertaken, increase in expenditure has been kept within reasonable limits.

Indian Airlines

Fleet Position. The fleet composition of Indian Airlines, at present, is as follows:

Airbus A300B2	8
B—737	21
HS—748	12
F—27	8
Total	49

Out of above, two B-737 aircraft have been leased to Indian Air Force for VVIP operations. Also, one F-27 aircraft has been leased to M/s. Vayudoot Private Limited.

The total number of seats available on the present fleet of Indian Airlines is 5502.

Working. The table below indicates the results of operating during 1979-80 and 1980-81:—

Table 142

	1979-80	*1980-81*
	(Rs. in crores)	
1. (a) Operating Revenue	205.05	286.15
(b) Operating Expenses	191.40	264.55
(c) Operating Profit	13.65	20.59
2. (a) Non-operating Revenue	2.63	8.97
(b) Non-operating Expenses	18.62	27.08
3. Net Profit/Loss	(2.34)	2.48
4. Gross Foreign Exchange Earnings	56.21	75.48

Vayudoot. Air services of Vayudoot Private Limited commenced on 26th January, 1981 by taking on lease one F-27 aircraft from Indian Airlines. In the first phase it was decided to cover 9 stations in the North East region and the operational headquarters of the new Airlines was set up at Gauhati.

Financial performance. Vayudoot has incurred a loss of approximately Rs. 63.54 lakhs till 31st October, 1981.

International Airports Authority. The International Airports Authority of India was set up with effect from 1st February, 1972 under the provisions of the International Airports Authority Act, 1971.

The Authority is responsible for the management of the four international airports namely Bombay, Calcutta, Delhi and Madras and for providing various services and facilities at these airports except those pertaining to air traffic control, aeronautical communication and navigational facilities, which are provided by the Civil Aviation Department.

Working. The Authority has earned as net profits after tax, Rs. 986.48 lakhs in 1980-81.

141. POSTS & TELEGRAPHS

The postal system, as we know it, was started in India by the East India Company. The first postage stamp was issued in Karachi in 1852. It was valid only in the Province of Sind. In 1854, the company constituted the Postal Service as a separate entity under a Director General and issued a postage stamp, on an all-India basis. The first telegraph line was put up in India in 1853. It extended from Calcutta to Agra. The Posts and Telegraphs system received statutory recognition under Act VI of 1898.

Growth of P and T. In 1864, there were 211 major and 451 minor post offices in the country, almost all of them confined to cities and major towns. They handled some 12 million postal articles a year. At the time of independence, on Aug. 15th, 1947, there were 22,116 post offices of various types in the country. Since independence, a systematic attempt has been made to see that every village in India had postal facilities.

As on 31.12.81, the total number of Post Offices in the country was as follows:

Rural	1,25,743
Urban	14,692
Total	1,40,435

Administration. The Secretary the Department of Communications is holding charge of the office of the Director General, P and T, and is also the Chairman of P and T Board. The P and T Board and Director General, Posts and Telegraphs, between them, exercise all the powers of the Department of Communications in administrative matters.

For administrative convenience, the country was divided into 92 functional and territorial units directly reporting to the P&T Directorate. They are (1) 16 postal circles, namely Andhra Pradesh, Bihar, Delhi, Gujarat, Jammu & Kashmir, Kerala, Madhya Pradesh, Maharashtra, Karnataka, North Eastern, North Western, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal, (2) 15 Telecommunications Circles, (3) 27 Telephone Districts and (4) 134 Functional Units (Dec. 1979).

Finance. The accounts of the P and T Department are maintained on a commercial basis. According to the revised convention between the Department and the General Revenues effective from 1st April, 1970, the Department pays a dividend to the General Revenues at the rate of 4.75 per cent on the net capital advanced up to 1963-64. On the additional capital outlay after 31st March 1964, dividend is payable at the rate of 6.75 per cent.

In spite of commercial overtones in accounting, P and T remains, first and foremost, a public service maintained irrespective of cost. This has been a change of policy inducted into the administration in recent years. Extension of postal services to remote and undeveloped villages naturally involved the maintenance of many unremunerative post offices and consequent loss to the Department.

The British administration had adopted the principle that any new post office opened must generate enough income to pay its way. Even after independence this principle was often declared and sometimes enforced. A policy of large scale expansion of postal facilities called for a revision of this principle. It was held that new post offices may be opened even at the risk of incurring losses as the postal service was run "primarily and essentially as a public utility service." This concession turned out to be the thin end of the wedge for very soon more and more offices were opened and losses on this account kept mounting. These uneconomic post offices in the rural areas showing persistent losses have gone on without a stringent assessment of their viability.

The Post and Telegraphs Tariffs Enquiry Committee has pointed out that no organisation "even with a public utility basis, professing to run on sound commercial lines would continue a losing activity as a permanent liability." The continuation of this policy was therefore considered "altogether indefensible". Nevertheless, the policy is being continued.

This willingness to lose has made the P & T department what it is—a mixture of opposites, with the posts perpetually losing and telecommunications perpetually making up for the losses. Between 1971 and 1980 the postal section showed a surplus of Rs. 2.27 cr. only in 1977-78 while it registered deficits ranging from Rs. 1.98 cr. in 1977 to Rs. 47.74 cr. in 1975-76. In all these years, telecommunications have made up for the postal losses except in 1975-76 when the profits it earned Rs. 43.35 cr. could not make up for the postal deficit of Rs. 47.74 cr. and the whole P&T department closed with a deficit of Rs. 4.41 cr. The following Table bears this out.

Table 143
Revenue & Expenditure of the P & T Dept.

(Rupees in crores)

		Expenditure				
Year	Revenue	Working Expenses excluding Depreciation	Deprecia-tion	Due Dividend during the year	Total	Surplus (+) Deficit (-)
1972-73	320.96	244.01	25.44	14.39	283.84	(+) 37.12
1973-74	360.79	282.06	23.31	22.33	332.70	(+) 28.09
1974-75	401.58	346.95	31.11	21.19	399.25	(+) 2.33
1975-76	483.61	427.27	35.36	25.39	488.02	(-) 4.41
1976-77	619.27	450.06	41.02	28.56	519.64	(+) 99.63
1977-78	668.19	463.73	47.48	29.95	541.16	(+) 127.03
1978-79	762.83	531.09	54.54	31.32	616.95	(+) 145.88
1979-80	835.05	606.80	61.89	32.51	701.20	(+) 133.85
1980-81	910.01	751.67	69.45	36.47	857.59	(+) 52.42

Source: P & T Dept.

PIN Code

As from August 15, 1972, which marked the Silver Jubilee of independence the postal department has introduced a new system, the *Postal Index Number* (PIN) code to facilitate the despatch and delivery of mail. Under this system numbers replace names of post offices in addresses. For the present, however, names are also retained along with numbers, so that the public may be saved unnecessary confusion.

The code is a six-digit number, where the first digit stands for a postal region or zone. There are 8 postal regions in India. The second and third digits stand for a sub-area in the region and the last three digits show the particular post office of delivery. Take, for instance, the PIN code for Kottayam-686 000. Here 6 stands for the region, that is, Kerala and Tamil Nadu States, of which Kottayam division is a part. The 2nd and 3rd digits 86 stand for Kottayam sub area. All postal offices in Kottayam division will have the common prefix 686. This is followed by 3 digits which indicate what the delivery post office is. 686 000 does not indicate any post office but 686 001 represents what was previously known as Kottayam 1., that is the Kottayam Head Post Office. 686 002 will represent the delivery office previously known as Kottayam 2, that is, the Collectorate Post office in Kottayam and so on.

The primary purpose of the PIN code is to expedite sorting at intermediate stations and delivery at the final station. In order to ensure quick and easy sorting, the postal dept. lays stress on the rule that the PIN code should be the last item on the address. If there is no space for an extra line at the bottom the PIN may be written in the last available line and sufficiently removed from the rest of the matter in that line.

This instruction has been wrongly interpreted by almost everybody. Since the last 3 digits indicate the delivery post office, the common practice now is to add the PIN immediately after the name of the delivery post office. It often happens that the name of the delivery post office is followed by the name of the State, say, Kerala and the country—India. Even in such cases the PIN shall come last, that is, after India, no matter how many things intervene between the name of the post office and India. Actually, there is no reason to name the larger area because it is already indicated by the first 3 digits.

Postal Services. The main service rendered by the postal department is collection, conveyance and delivery of mail articles. Mail articles include ordinary and registered letters, registered and unregistered parcels, Value Payable articles (VPP) and money orders. Among other services are Savings Bank accounts and life insurance policies. Mail is conveyed by whatever means available at hand. Where no motorised transport is available, mails are carried by messengers on foot or on bicycles or by mules and camels. However, the bulk of the mail is carried by Railway Mail Service (RMS).

Coverage of Posts. With a steady increase in the number of post offices every year, the average area served by a post office was reduced to 23.9 sq. km and the average population to 4001 in March 1980.

Mail Traffic. About 973 crore pieces of mail (excluding money orders) were processed. 24.33 lakh registered articles accounted for 2.5% of the total mail traffic. Newspapers and periodicals formed a sizeable chunk of the total volume. 11.18 lakh inland money orders of the total value of Rs. 12.51 crores were issued; the commission realised on them was about Rs. 30 crores.

Returned Letter Offices. 15 Returned Letter Offices (RLO) situated at different places in the country handled about 278 lakh items of mail having insufficient or illegible addresses.

Savings Bank. The Post Office Savings Bank remains the nation's largest Savings Bank. More than 1,38,000 Post Offices provide Savings bank facility throughout the country. 1.24 lakh post offices in the rural areas provide Savings Bank Service, the coverage being much more than provided by the Commercial Banks. The aggregate investment on 31.3.1981 in all forms of National Savings was Rs. 78.59 crores.

Telecommunications

The rural bias imported into the postal service has been extended to telecommunications also from April 1, 1977. Formerly the policy followed was that telegraph offices could be opened only in places which would assure a return of at least 25 per cent of the annual recurring expenditure. This percentage was reduced to 15 in backward areas and 10 in remote hilly areas. This limitation has been removed and telecommunications offices can now be opened in all important places like Tehsil or Block headquarters and in places with a population of 5000 in ordinary areas and 2500 in backward or hilly areas.

Telegraphs. The first long-distance overhead telegraph was started in 1853 between Calcutta and Agra. This line was later extended to Bombay on one side and Peshawar on the other. Telegraph circuits were gradually extended all over India till they reached 14,900 miles in length. The telegraph service in India celebrated its centenary in November, 1953.

Telephones. Telephone service started in India barely five years after the telephone was invented by Graham Bell. The first telephone system was a 50-line telephone in Calcutta in 1881. The first automatic telephone exchange was installed at Simla in 1913.

International Telephone Service

Direct Telephone service is now available to 43 countries of which 36 are connected through satellite telephone circuits. Switched Telephone service is now available to almost all the countries of the world.

Finances of P&T. The capital invested in fixed assets till March 1980 amounted to Rs. 2041.65 cr. Out of this, the dividend bearing capital outlay came to Rs. 609.90 cr. The year 1979-80 closed with a surplus of Rs. 133.85 cr. The revenue for the year amounted to Rs. 835.05 cr. and the expenditure (including Rs. 32.51 cr. paid as dividend to the General Revenues) came to Rs. 701.20 cr.

Overseas Communication Service (OCS)

The Overseas Communications Service (OCS) of the Ministry of Communications was formed as a Government Department on 1st January, 1947 consequent on the nationalisation of the Indian Radio and Cable Communications Company. It is responsible for the planning, establishment, maintenance and operation of India's external telecommunication services. It has four gateway centres at Bombay, New Delhi, Calcutta and Madras. In addition to HF radio stations at these centres, there are two satellite earth stations viz., Vikram Earth Station, Pune and Ahmed Earth Station, Dehradun operating with the Indian Ocean Region Satellite of the International Telecommunications Satellite Organisation (INTELSAT). These two stations are connected to the two gateway centres in Bombay and New Delhi respectively.

OCS handles the bulk of telephone, telex, and telegraph traffic via satellite transmission medium. A small portion is handled through HF radio system.

OCS operates direct telephone links with 40 countries, telex links with 38 countries & Message telegraph links with 32 countries.

Telephone, telex and telegraph service is being provided to almost all parts of the world by direct or transit service. Satellite telephone sevice is also available to ocean liners equipped with requisite MARISAT satellite communication facilities. Inter-national subscriber dialled (ISD) telephone service is available from Bombay, New Delhi, Calcutta and Madras to the United Kingdom on round-the-clock basis. Fully automatic Subscriber dialled telex service is available to 46 countries.

Wireless Wing. All responsibilities in regard to coordination and regulation of radio spectrum usages in the country are entrusted with the Wireless Planning and Coordination Wing of the Ministry of Communications. This Wing was established in 1952. It has a field organisation called the Monitoring Organisation which was established in 1956.

Radio Frequency. During the year 1980-81, frequency authorisation in respect of 2581 frequency usages was issued to the various wireless user departments after necessary coordination at national level. In addition to these, 510 assignments for HF Broadcasting were coordinated with International Frequency Registration Board (IFRB). About 483 notices of frequency assignments in various frequency bands were also sent to International Frequency Registration Board for registration in the Master International Frequency Register (MIFR) to secure international protection and recognition to the new frequencies brought into operation by the wireless user departments.

Licensing. Under the Indian Telegraph Act, 1885, the Wireless Planning and Coordination Wing of the Ministry grants licences to establish, maintain and work wireless stations for various services like point to point radiocommunications, maritime and aeromobile services, meteorological services, fire-brigades, security links, maintenance of pipe lines, public transport and electricity power grids, prospecting of minerals etc. Licences are also issued for operation of wireless stations for sports and recreation and for carrying out research and studies in educational institutions, laboratories, etc. At present there are 15707 such licences issued to various Government and private parties in the country. This is in addition to authorisation given to Central Government Departments

Growth of Traffic. The countrys international telecommunication traffic continues to grow steadily. The volume of telephone and telex traffic during 1981-82 is expected to go up to 26,960 thousand minutes and 32,100 thousand minutes respectively as against 22,239 thousand minutes and 26,276 thousand minutes in 1980-81. Similarly, the volume of photo telegraph service is also likely to go up from 1,177 to 1,257 thousand sq. cm.

Financial Review. There has been a steady growth in gross revenues and net profits. The total gross revenue is expected to increase from Rs. 61.88 crores in 1980-81 to Rs. 64.75 crores during 1981-82. The net profit is also expected to go up from Rs. 42.15 crores in 1980-81 to Rs. 44.71 crores in 1981-82.

Public Sector Undertakings. There are two Public Sector Undertakings under the administrative control of the Ministry namely, Indian Telephone Industries Limited, Bangalore and Hindustan Teleprinters Limited, Madras. Preliminary work for setting up another Public Sector Undertaking under this Ministry for manufacture of Electronic Switching Equipment has been taken up.

Box 52
Progress of Postal Savings Bank

The Government Savings Bank passed to the Postal Dept. on April 1, 1882. Now, as on April 1, 1982 the Post Office Savings Bank completed 100 years of service to the nation.

Year	*number of post office savings banks*	*number of depositors (lakhs)*	*aggregate deposits (Rs. crores)*
1883	4,238	0.44	0.28
1900	6,500	7.4	9.65
1925	10,727	21.6	25.64
1950	9,256	38.1	167.00
1960	17,926	84.5	386.75
1970	86,007	197.2	890.00
1980	1,36,000	450.0	6856.00
1982	1,41,000	607.0	9327.00

142. BROADCASTING & TELEVISION

Broadcasting (Ākashvanī). Broadcasting was pioneered in India by the Madras Presidency Radio Club in 1924. The Club worked a broadcasting service for three years, but owing to financial difficulties gave it up in 1927. In the same year (1927) some enterprising businessmen in Bombay started the Indian Broadcasting Company with stations at Bombay and Calcutta. This company failed in 1930. In 1932 the Government of India took over broadcasting. A separate department known as Indian Broadcasting Service was opened. The Service was later designated 'All India Radio' (AIR) and was placed under a separate Ministry—the Ministry of Information and Broadcasting. The AIR is controlled by a Director General, who is assisted by several Deputy Directors and a Chief Engineer.

Broadcasting in its significance, reach and impact constitutes the most powerful medium of mass communication in India. Its importance as a medium of information and education is particularly great in a vast and developing country like India where the reach of the printed word is neither wide nor deep. While the total circulation of all the newspapers in India, including both English and vernacular papers, is around 8 million, there are, according to a recent estimate, nearly 400 million potential listeners to All India Radio.

Broadcasting in India is a national service developed and operated by the Government of India. As a national service AIR seeks to represent in its national and regional programmes the attitudes, aspirations and attainments of all sections of the Indian people and attempts to reflect, as fully and faithfully as possible, the richness of the Indian scene and the reach of the Indian mind.

All India Radio switched over to new medium-wave frequencies allotted to its various stations from November 23, 1978. The new frequencies were allotted to India under a rationalised plan drawn up for use of medium-wave frequency channels by various countries.

AIR with its network of 85 broadcasting centres serves 87% of the population. It has two divisions—Home services and External Services.

Home Service. The home service in terms of broadcasting hours is made up as follows: music-40.60%, news-23.16%, talks-8.99%, drama-3.39%, rural programmes-5.36%, educational broadcasts-3.19%, youth programmes-2.85% and other special audience programmes- 12.46%.

In its home division AIR puts out 68 news bulletins for 10 hrs 8 mins daily in 19 Indian languages on a national basis and 116 bulletins for 15 hrs 29 mins daily in 23 languages and 33 tribal dialects, on a regional basis.

Started in 1952, the weekly *programme of music* comprises not only the current exponents of Hinsustani and Carnatic music but also the records of old masters. *Talks* cover all subjects of current importance and are broadcast both in Hindi and English. More than 5000 *radio plays* in all languages are broadcast in an year. *Yuva vani*, the programme for youth, includes various items, music, talks, plays and interviews. *Vividh Bharathi* is a light entertainment programme. *Sports* events in India and abroad are fully covered in daily news bulletins in Hindi and English.

External Services. The External Services Division of All India Radio aims at projecting an objective image of the country to listeners abroad explaining the country's point of view on matters of national and international importance and stimulating interest abroad in the rich heritage of India's art, culture and traditions. It broadcasts programmes of varying durations round-the-clock in 25 languages—17 foreign languages, including English, in 28 transmissions and 8 Indian languages in 16 transmissions, aggregating 56 hours and 15 minutes of broadcasting time every day.

The General Overseas Service in English broadcasts in four transmissions daily for 9 hours and 45 minutes and is beamed to South-East Asia, North Asia, Australia, New Zealand, North Africa, West Africa, East and South Africa and West Europe. The other foreign language services of the Division include those in Pushtu, Dari, Persian, Arabic, French, Indonesian, Swahili, Sinhala Tibetan, Thai, Russian, Chinese, Nepali, Baluchi and Burmese.

The Urdu Service is broadcast in three daily transmissions for a total duration of 12 hours and 15 minutes daily.

Other Indian languages in which programmes ar broadcast are Tamil, Hindi, Gujarati, Konkani, Sindhi, Punjabi and Bengali.

Television

Television (Doordarshan) started as a modest affair in India, on Sept. 15, 1969 when the AIR set up an experimental TV service in Delhi. As from April 1, 1976 the TV was de-linked from the AIR and made into an independent Directorate.

The TV programme was speeded up in 1972, when a number of TV centres were opened in quick succession in Bombay, Srinagar, Amritsar, Calcutta, Madras, Lucknow and Jullundur. TV now covers 832.1 lakh people both urban and rural and an area of over 20,000 sq. km.

Doordarshan has a network of 7 full-fledged centres (kendras), 3 base production centres, 7 on-going SITE transmitters and 4 relay centres as enumerated below:-

Full-fledged TV Centres:— Delhi, Bombay, Jullundur, Srinagar, Calcutta, Madras and Lucknow.

Base Production Centres-Upgraha Doordarshan Kendras, Delhi, Cuttack and Hyderabad.

SITE on-going Transmitters: Hyderabad, Muzzaffarpur, Sambalpur, Raipur, Jaipur, Gulbarga, and Pij (Ahmedabad).

Relay Centres:- Mussoorie, Kanpur, Pune and Amritsar.

SITE areas. The TV programme meant for the rural population started with the SITE project in 1975-76 and has extended to cover Rajasthan, Madhya Pradesh, Bihar, Orissa, Andhra Pradesh, Karnataka and Gujarat.

Colour TV. It has been decided to provide TV coverage in colour for Asian Games for foreign broadcasting organisations. Steps have been taken to procure four colour Outside Broadcast Vans (OB Vans) and other necessary equipment. An experimental colour transmission was done from International Trade Fair at Pragati Maidan, New Delhi for a fortnight. Later, in March, 1982, a trial colour transmission comprising a 40-minute highlight of Festival of India, London, was successfully telecast from Delhi Doordarshan Kendra.

Commercials. Commercials on Doordarshan were introduced from January 1, 1976, and, at present, are telecast from seven centres, namely, Delhi/Mussoorie, Bombay/Pune, Lucknow/Kanpur, Amritsar/Jullundur, Calcutta, Madras and Srinagar. Income from commercials has steadily increased from Rs. 77 lakhs in 1976-77 to Rs. 1150 lakhs (approx) in 1981-82.

A new rate-card rationalising the tariff structure for TV commercials was introduced from the 1st April, 1982. This will enable Doordarshan to increase its revenues substantially from commercials.

143. THE SCREEN

The Advent of the Cinema

The cinema came to India as early as 1896. The first motion picture was shown in India on July 7, 1896 at Watson's Hotel, Bombay by the touring agents of the famous Lumiere Brothers of France. The show had a duration of less than an hour and consisted of items like "the arrival of a train, the sea bath, workers leaving a factory and ladies and soldiers on wheels". *The Jubilee Procession* in England in 1897 was the next important exhibition in India. It became a hit. Indian scenes captured by some foreign photographers were also shown now and then, with items like *Coconut Fair, Our Indian Empire* and *A Panorama of Indian Scenes*.

The first Indian to make a film was Harischandra Bhatvadekar, also known as Sava Dada. In 1899 he photographed and exhibited his own short items, *The Wrestlers* and *Man and Monkey*. By this time a change had come in film exhibitions in Europe. Instead of photographing actual scenes, imaginary scenes were staged by actors which were photographed into films. *The Death of Nelson* was one such. This opened a new line in film photography which was destined to revolutionise the film industry.

Feature Films. The first Indian story film *Pundalik* was made by R. G. Torney and N. C. Chitra and released at the Corporation Cinematograph, Bombay, on May 18, 1912. This film centred round a saint of the same name in Maharashtra. The next year, on May 3, 1913, Dada Phalke released the long film story *Raja Harischandra* at the same theatre. *Pundalik* was half-British in its make, it being photographed by an English cameraman, Johnson. *Raja Harischandra* was cent per cent Indian. Dada Saheb did everything himself from the script down to the marketing of the film. For this reason, Dada Saheb Phalke has been rightly acclaimed as the *Father of the Indian Cinema*. Phalke laid down the basic norms of Indian films, in form and content, which have been largely followed ever since.

Phalke went on to produce two more films *Mohini Bhasmasur* and *Satyavan Savitry* both drawn from Hindu mythology. He took his 3 films to London, where they were exhibited. They won all round praise.

In September 1917, Phalke released his most ambitious film venture, *Lanka Dahanam*, again a mythological story. Exhibited in a double programme, with an English film called *The Blind Fate*, *Lanka Dahanam* (Burning of Lanka) proved to be a big box-office hit. This success conclusively dispelled all fears about the future of the film industry in India.

In March 1917, J. F. Madan of Calcutta produced *Satyavadi Raja Harischandra*, based on the same mythological story as Phalke's *Raja Harischandra*.

These three men, R. G. Torney, Dada Saheb Phalke of Bombay and J. F. Madan of Calcutta are the pioneers of the film industry in India. J. F. Madan was, in addition, the pioneer of cinema houses. In 1907, he built India's first cinema house in Calcutta. His company, the *Elphinstone Bioscope Company*, sponsored the gigantic chain of cinema houses in India, later known as Madan Theatres.

Madras entered the film industry with *Keechaka Vadhom*, a mythological story, in 1919. With the end of the First World War many sub-centres of Film production emerged—*Kolhapur, Nasik, Sangli* and *Poona*, around *Bombay, Vijayawada, Salem* and *Coimbatore*, around Madras and *Gauhati* and *Bhubaneswar around Calcutta. By 1929, India was producing about 38 films a year. The production shot up to 270 in 1931, placing India among the three largest producers of feature films in the world.*

Talkies. The talkies came to India with a bang and quickly displaced the movies. The first talkie in India *Alam Ara*, was made by Ardeshir Irani in 1931 at the Imperial Film Studio in Bombay. It was in Hindustani and was screened at Bombay on March 1, 1931. Irani as the pioneer of talkie is to be counted along with R. G. Torney, Dada Saheb Phalke and J. F. Madan as one of the founders of the Indian cinema.

Alam Ara was quickly followed by other Indian talkies which totalled 28 in 1931. The talkies tolled the knell of the silent films or movies. From a record production of 270 in 1931, the silent films came down to a mere 7 in 1934 and faded out completely by 1936. In 1971 India gained for the first time the top place in world film production and has maintained the lead ever since.

Diamond Jubilee. Between May 18, 1912 when the first Indian feature film, *Pundalik* was exhibited and May 18, 1972 when the country celebrated the Golden Jubilee of the film industry, India had produced a total of 11385 films (including 1279 silent films) in 27 languages, five of them foreign—English, Arabic, Persian, Sinhala and Nepalese.

India continued to be the world's topmost producer of films when the talkie celebrated its Golden Jubilee in March 1981. In 1980, India had produced 742 films.

Documentaries & Newsreels. Weekly Indian News Review, cartoon films, quickies and documentaries required for public information or education are produced by the Films Division in the Ministry of Information and Broadcasting. The Division first set up in 1948 started from small beginnings with about 33 documentary films, 12 compilations and 52 newsreels in 1949-50. Currently, the Division produces on an average 100 short films, (including cartoon films), 52 national newsreels and 52 regional newsreels. The object of the Division is to record the contemporary history of India and present filmic reports on the socio-economic progress of the country. Most of the films are produced in English and the 15 regional languages listed in the Constitution.

Every cinema house in India is required, under the terms of its licence, to exhibit at each performance not more than 609 metres of 'approved films' supplied by the Division on a rental of one per cent of the average weekly collections. One newsreel and two short films are released every week at important centres. These are then rotated to cinema houses at other places in the country. In 1978-79, the Division earned Rs. 303 lakhs by way of rentals from cinema houses. From 1 April 1979 to 29 February 1980, the rentals amounted to Rs. 244.15 lakhs. However, from 1 April 1979 to 31 March 1980, 7622 prints were supplied free of charge.

Popular Entertainment. The screen is today India's most popular entertainment. The fast growth of cinema houses in the country attests to this. In 1965-66 India had a total of 5447 cinema houses. In 1980 (March 31) the number of cinema houses nearly doubled itself with a total of 10552.

1982. The total number of cinema houses in the country has reached 11,239 (as on 31-3-1982) showing an increase of 426 new cinemas (or 4 per cent) over the previous year total of 10,813 (as on 31-3-81). There are at present 6882 permanent theatres and 4248 of temporary type as compared to the corresponding figures of 6577 and 4146 of 1981. There are 109 military cinemas in 1982 as compared to 90 theatres in 1981.

The State of Andhra Pradesh with 1961 cinemas tops the list while the second place is held by another Southern State Tamil Nadu, with 1777 cinemas. Kerala has 1194 cinema theatres. The Southern region with its total of 6049 theatres maintains its top position accounting for 53.8 per cent (as in 1981) of the total cinema houses in the country. Sikkim, Arunachal Pradesh and Dadra and Nagar Haveli with 2 cinema halls each have the lowest number among the States/Union Territories which possess cinema halls.

Film on Mahatma Gandhi. The year also saw the culmination of the proposals in respect of the production of the film on Mahatma Gandhi, in association with Sir Richard Attenborough, the Director of the Film and M/s Indo-British Films. All the shooting of this film as well as most of the post-production work has been completed and the film is expected to be released towards the end of 1982.

Languages. Films are produced in all important languages of India and even in some provincial dialects like Bhojpuri, Konkani and Badaga. Till 1979, Hindi with its variants accounted for the largest number of films. After 1979, Hindi lost ground to South Indian languages.

Themes. The majority of Indian films treat of social questions. In 1977, social themes took up 420 films out of a total of 557. The proportion in 1978 was 458/619 and in 1979, 594/714. The next important theme is crime which had 55/557 in 1977, 78/619 in 1978 and 37/714 in 1979. Two other popular themes are mythology and legends. In the early years these two subjects dominated but they steadily lost ground to social themes in later years. Today neither of them (myths and legends) commands any appreciable share in production.

Largest Producer. India continues to produce the largest number of feature films and during the year 1981, 737 films were certified. An interesting feature this year, as in the last few years, was a change in the quantitative production pattern of feature films in various Indian languages. Till 1977, the number of feature films in Hindi/Urdu used to be the highest. In 1978, Malayalam films topped the list in number (123) followed by Hindi (122) and Tamil (105). In 1979, Tamil topped the list in number (140), followed by Telugu (133) and Malayalam (131) relegating Hindi (114) to the fourth place. In 1980, Telugu went to the top of the ladder with 152 films, followed immediately by Hindi/Urdu and Tamil simultaneously (145) pushing Malayalam to the third position (99). However, the year 1981 saw Hindi/Urdu go up to its peak with 153 films with Tamil (137), Telugu (132) and Malayalam (111) taking the second, third and fourth places respectively.

Production of feature films in colour in India has been going up. In 1973, out of a total of 447 feature films, 175 films were in colour (39%). In 1981, out of a total of 737 films 665 were in colour (89.46%). It is significant that all the films certified in Hindi/Urdu, Gujarati, Punjabi, Bhojpuri, English, Rajasthani and Tulu were in colour during 1981

National Film Festival. The 28th National Film Festival (for films certified for public exhibition during 1980) was held from April 23, 1981. In this Festival 79 entries were received in the feature film category and 104 in the short film category. The feature film jury was headed by Dr. V. Shantaram, the well-known film producer and Director. Shri B.D. Garga headed the short film jury.

Awards. The award for the Best Feature Film was given to Aakaler Sandhane (Bengali) produced by Shri Dhiresh Kumar Chakraborty and directed by Shri Mrinal Sen. Bhavni Bhavai (Gujarati) was adjudged the best feature film on national integration. Awards for the best feature film in each regional language were given to Anirban (Assamese), Hirak Rajar Deshe (Bengali), Aakrosh (Hindi), Yagam, (Malayalam), Chann Pardesee (Punjabi), Nenjathai Killathe (Tamil) and Harischandrudu (Telugu)

The Dadasaheb Phalke Award for outstanding contribution to the cause of Indian cinema went to Shri P. Jairaj

Censorship

The Board granted 2000 'U' and 206 'A' certificates in respect of Indian films in 1981. (The figures for the period April—December, 1981 were 1,464 'U' and 155 'A' certificates).

The Board granted 1,772 'U' certificates and 95 'A' certificates in respect of foreign films during 1981. (The figures for the period April-December, 1981 were 1,188 'U' and 68 'A' certificates).

National Film Awards

Originally instituted in 1953, the first all-India awards were only two—President's Gold Medal for the Best Feature Film and Prime Minister's Gold Medal for the Best Children's Film. All other awards were dubbed State Awards. In 1966 the State Awards were elevated as National Awards.

In 1969 the Dada Saheb Phalke Award for outstanding contribution to the cause of the cinema was instituted—a belated but eminently fitting tribute to the memory of the Father of the Indian Cinema.

In 1975 the scope of the awards was enlarged covering 41 categories consisting of all-India and Regional Awards. The Gold Medal was replaced by Swarna Kamal (Golden Lotus). Awards of the second order were called Rajat Kamal (Silver Lotus). (See 1982 editon for further details).

144. THE PRESS

The year 1980 marks the bi-centenary of Indian journalism. The first newspaper in India on modern lines appeared in Calcutta on the 27th January, 1780. This was the *Bengal Gazette*, published in English by an Englishman, J.A. Hickey. Hickey's Gazette, as it was popularly called, was a political and commercial weekly "open to all parties but influenced by none". However, it displeased the officers of the day and had to down shutters within an year. Messink and Reed who started the *India Gazette* also in 1780 played it safe, towing the official line. The *Calcutta Gazette* appeared in 1874. Other journals followed—the *Calcutta Chronicle*, The *Madras Courier* (1875), the *Bombay Herald* (1879) and others. Though all these papers took care not to offend the government, none of them could survive long. All these periodicals were run by Englishmen in English for the Englishmen in India.

During the Second World War, when the British administrators wanted the cooperation of the Indian people, a gentlemen's agreement was concluded between the Government and the Press, which resulted in the Press Advisory Committee at the Centre and in most of the States. This gave the Press a consultative status.

When India became free, there was no longer any antagonism between the Government and the people and the Press was free to play an entirely new role. In March 1947, the Government appointed a Press Laws Enquiry Committee, as a result of which, the obnoxious provisions of the Press Acts until then in force were removed and a policy of consultative co-operation between the Government and Press was inaugurated.

After the proclamation of Emergency on June 25, 1975 three ordinances were issued (i) abolishing the Press Council, (ii) repealing the Parliamentary (Protection of Publication) Act and (iii) promulgating a new law—The Prevention of Publication (Objectionable Matter) Act (POMA). The press was thus reduced to the position of an orderly of the government.

The Janata government which rode to power on the 1977 March elections promptly repealed the POMA, restored the Parliamentary Proceedings (Protection of Publication) Act and took steps to re-constitute the Press Council.

Vernacular Journalism‡ Vernacular journalism, that is, newspapers published in Indian languages, was slow on the uptake. Nevertheless, a number of periodicals—most of them short-lived—appeared in India in the latter half of the 19th century. The oldest surviving vernacular newspaper is *Bombay Samachar* in the Gujarati language which was established in Bombay in 1822.

Most of the vernacular journals owed their origin to the national consciousness awakened by the revolution of 1857 against British rule in India. Naturally, their tone and temper displeased the British administration. The result was the Vernacular Press Act

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Official language avoids the word *vernacular* and uses *language* instead. Whatever the reason for this synthetic substitute, it verges on the ridiculous, when newspapers in different Indian languages are involved. We therefore stick to *vernacular*.

1878 which strictly controlled Indian papers. With the growth of the national movement, drastic press legislations followed one another,—Official Secrets Act 1923, India Press (Emergency Powers) Act 1931, Foreign Regulation Act 1932, Indian States (Protection) Act 1934 etc.

The vernacular papers greatly exceeded the English papers in number. In 1953 out of a total of 8134 newspapers, vernacular papers numbered 6800.

The English Press. The English Press also showed a healthy growth. In 1952 there were 70 English dailies. In 1977 there were 2559 English newspapers in India of which 85 were dailies. Six of these were centenarians, *The Times of India*, Bombay (1838), *The Pioneer*, Lucknow (1865), *The Mail*, Madras (1867), *The Amrita Bazar Patrika*, Calcutta (1868), *The Statesman*, Calcutta (1875), and *The Hindu*, Madras (1876).

Periodicals. Periodical journalism had from the first formed the major segment in Indian journalism. In 1952 there were 6166 weeklies and other periodicals among a total 6762 newspapers. At the end of 1975, out of 12,423 newspapers 11,518 were periodicals. Periodicals in English claimed the top place in circulation with 56.98 lakhs in 1975. Hindi came next to English with a circulation of 56.81 lakhs. Six other vernacular languages, *Malayalam, Bengali, Gujarati, Urdu, Marathi* and *Telugu* claimed circulation of a million copies or more of periodicals.

Press Information Bureau. The Press Information Bureau is the centralised agency handling the press and public relations of the Government of India. Its principal functions are: to disseminate information to the Press and other publicity media in the country; act as a clearing house for official data and information for use by all the publicity media and to provide a reliable feedback service to the Government on press and public reactions to official policies and programmes.

Press Council of India*. The Press Council of India was set up with effect from March 1, 1979 under the Press Council Act, 1978 for safeguarding the freedom of the Press and maintaining and improving the standards of newspapers and news agencies in India. The Council consists of a Chairman and twenty-eight other members representing various interests. The Council has the power to consider complaints *suo motu*, in addition to inquiry into complaints brought before it against newspapers, news agencies, editors and journalists.

The Council started functioning from April, 1979 under the Chairmanship of Shri Justice A.N. Grover and has finalised the regulations concerning the procedure for inquiry into complaints and also transactions of business.

News Agencies. In pursuance of the policy decisions taken in 1978 under which the four news agencies, viz., Press Trust of India, United News of India, Hindustan Samachar and Samachar Bharati started functioning as separate independent entities. Government have released grants-in-aid totalling Rs. 36.19 lakhs to the four news agencies on account of salary differential of their employees during the year 1979-80.

Registrar of Newspapers. The Office of the Registrar of Newspapers of India was set up on July 1, 1956. The Press Registrar is the statutory authority for the collection of statistics regarding the Press in the country. Under the Press Registrar, a central agency has been created to maintain a register of newspapers containing prescribed particulars about every newspaper in India.

Total Number of Newspapers. During 1979 the total number of newspapers in India was 17,168 as compared to 15,814 in 1978, an increase of 8.6 per cent.

Table 144

Leading Newspapers and Periodicals with an average circulation of a lakh and more for the period Jan.—June 1982

Dailies

Name	Circulation
Amar Ujala (H), Agra	69,298
Amar Ujala (H), Bareilly	40,116
Amrita Bazar Patrika (E), Calcutta	140,290
Ananda Bazar Patrika (B), Calcutta	408,010

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* The earlier Press Council of India was set up on 4 July, 1966 under the Press Council Act of 1965. The Council functioned as a quasi-judicial body for adjudicating on complaints against newspapers, news agencies and journalists offending journalistic ethics and public taste. The Press Council was dissolved (with effect from 1st January, 1976) after the expiry of its term.

Bombay Samachar (G), Bombay	140,567
Daily Jagran (H), Jhansi	14,448
Daily Jagran (H), Kanpur	102,976
Daily Jagran (H), Lucknow	29,158
Daily Thanthi (Tam.), Madras, Madurai, Tiruchi, Coimbatore, Tirunelveli, Vellore, Cuddalore, Salem & Bangalore	265,082
Deccan Herald (E), Bangalore	111,437
Dinamani (Tam.), Madurai & Madras	166,152
Eenadu (Tel.), Hyderabad, Visakhapatnam & Vijayawada	208,135
Gujarat Samachar (G), Ahmedabad & Surat	191,647
Hindu (E), Madras, Coimbatore, Bangalore, Hyderabad & Madurai	325,378
Hindustan (H), New Delhi	160,030
Hindustan Times (E), New Delhi	252,554
Indian Express (E), Bombay	139,248
Indian Express (E), New Delhi, & Chandigarh	149,140
Indian Express (E), Madurai, Vijayawada, Madras, Bangalore, Cochin & Hyderabad	256,717
Jugantar (B), Calcutta	307,172
Kerala Kaumudi (Mal.), Trivandrum	126,535
Lokasatta (M), Bombay	211,752
Maharashtra Times (M), Bombay	194,121
Malayala Manorama, (Mal.), Kottayam, Kozhikode & Cochin	500,140
Mathrubhumi (Mal.), Calicut, Cochin & Trivandrum	341,646
Nai Dunia (H), Indore	127,429
Nav Bharat (H), Nagpur, Jaipur, Bhopal, Raipur & Indore	135,704
Nav Bharat Times (H), New Delhi	285,622
Nav Bharat Times (H), Bombay	85,652
Prajavani (K), Bangalore	169,546
Punjab Kesari (H), Jullundur	206,489
Rajasthan Patrika (H), Jaipur, Jodhpur & Udaipur	119,972
Sandesh (G), Ahmedabad	140,978
Times of India (E), New Delhi	171,779
Times of India (E), Ahmedabad	49,317
Tribune (E), Chandigarh	156,539

Weeklies

Ananda Vikatan (Tam.), Madras	267,915
Andhra Bhoomi Sachitra Vara Patrika (Tel.), Secunderabad	101,104
Bombay Samachar (G), Bombay	163,751
Dharmayug (H), Bombay	218,861
Illustrated Weekly of India, Bombay	203,909
Kalkandu (Tam.), Madras	168,006
Kungumam (Tam.), Madras	139,739
Lokasatta (Sunday) (M), Bombay	342,740
Malayala Manorama Weekly (Mal.), Kottayam	553,941
Mangalam (Mal.), Kottayam	200,505
Manorajyam (Mal.), Kottayam	205,049
Mayapuri (H), New Delhi	148,541
Pravasi (G), Bombay	100,154
Rani Weekly (Tam.), Madras	381,154
Saptahik Hindustan (H), New Delhi	109,985
Screen (E), Bombay	145,938
Shree (M), Bombay	112,201
Sitara (Tel.), Hyderabad	100,901
Sudha (K), Bangalore	161,781
Sunday (E), Calcutta	204,590

Fortnightly & Monthly Magazines

Balarama (Mal.), Kottayam	113,927
Competition Success Review (E), New Delhi	214,813
Femina (E), Bombay	103,058
Filmfare (E), Bombay	121,132
Filmi Duniya (H), New Delhi	135,779
Madhuri (H), Bombay	111,095
Manohar Kahaniyan (H), Allahabad	345,060
Manorama (H), Allahabad	162,681
Maya (H), Allahabad	124,372
Nandan (H), New Delhi	186,674
Nutan Kahaniyan (H), Allahabad	130,644
Rani Muthu (Tam.), Madras	133,192
Stardust (E), Bombay	125,921
Star & Style (E), Bombay	107,885
Vanitha (Mal.), Kottayam	234,645

Note: Language Symbols:—B: Bengali, E: English, G: Gujarati; H: Hindi, K: Kannada, M: Marathi; Mal: Malayalam; Tam: Tamil; Tel: Telugu.

Source: Audit Bureau of Circulation Ltd., Bombay.

Box 53

Newsprint Shortage

Inadequate indigenous production, high cost/price structure and inept handling of imports and distribution has hindered the healthy growth of the newsprint industry. Production of indigenous newsprint has remained more or less stagnant over the last decade. From 36,000 tonnes in 1973-74, the output reached the level of 55,000 tonnes in 1976-77, but fell thereafter, reaching a low of 40,000 tonnes in 1980-81. It picked up somewhat during the last year to reach 63,000 tonnes which was sufficient to meet only 15 per cent of the domestic requirements of 4.2 lakh tonnes.

145. EDUCATION

Education is a State subject and the central government has little to do with it. In primary and secondary education the role of the central government is purely advisory. At the University level the central government comes into the picture via the University Grants Commission and the Research Organisations.

It is therefore no surprise that the educational picture in India is widely variegated. But this is no reason why Indian education should be so grossly incompetent—and inadequate. It is customary to blame the States for the very bad educational performance. But in this context it is well to remember that Indian States took on some semblance of permanence only with the States Reorganisation Act, 1956. Even after this Reorganisation new states were created. Gujarat and Maharashtra were created in 1960, Nagaland in 1961, Haryana and Punjab in 1966, Himachal Pradesh in 1971 and Manipur and Meghalaya in 1972. The re-organised States themselves were a jumble of uneven territorial pieces, some enlightened, some benighted, some rich, some poor. These states had therefore first to work out for themselves some sort of internal cohesion and equilibrium.

Kerala is typical. The present State of Kerala was formed by the amalgamation of two princely States—Travancore & Cochin—well advanced in education with Malabar, a British-administered territory and lamentably backward. Kerala thus faced a formidable educational problem in 1956, namely to pull up Malabar to the level of Travancore and Cochin without halting the further progress of the latter.

National Educational Policy. The National Policy on Education adopted by the Parliament in 1968 was mainly based on the recommendations of the Education Commission under Dr. D.C. Kothari. The policy stressed the following objectives.

(i) Free and compulsory education up to the age of 14; (ii) improved status, emoluments and education of teachers; (iii) three-language formula and development of regional languages; (iv) equalisation of education of science and research; (v) development of education for agriculture and industry; (vi) improvement in quality and production of inexpensive text-books; and (vii) investment of 6 per cent of national income in education.

As laid down in the National Policy on education, the Central Advisory Board of Education has adopted a unanimous resolution recommending that the new pattern of 10+2+3 should be introduced all over India during the V Plan period. The Vice-Chancellors' Conference held on September 30, 1975 decided that in view of the agreement that 10+2 should be the pre-university level, the new enriched 3-year first degree course should be launched with effect from or about the academic year 1979-80. All the State Governments are to be advised to plan their Secondary education accordingly.

New Pattern of Education. The new pattern of education envisaged an integrated course of fifteen years' duration leading to the first degree. (i) Ten years in school covering Primary, Middle and High School grades (ii) Two years in Higher Secondary schools, Intermediate or Pre-university Colleges and (iii) Three years in Colleges culminating in a Bachelor degree in any discipline.

The new pattern of School education has already been adopted by 15 States and 8 Union Territories and also by schools affiliated to the Central Board of Secondary Education. The Union Territory of Mizoram is likely to introduce this pattern from the academic year 1982-83. The States of Haryana, Himachal Pradesh, Madhya Pradesh, Meghalaya, Punjab, Rajasthan and Uttar Pradesh have also accepted the new pattern in principle, but have yet to determine the date of adoption. They have been urged to speed up the switch-over.

Universal Education. A working group appointed by the Government of India reported in August 1980 on the policy to be adopted in the eighties to equalise educational opportunities among all sections of the people. The group pointed out "that education is a crucial input in the development of human resources....and that it should find its rightful place as a basic input in national planning. Investments in education should reflect its pivotal role."

The programme of universalising elementary education constitutes one of the two topmost priority programmes in the field of education, the other being the National Adult Education Programme.

The State Plans for universalising Elementary Education have proposed a number of measures for retaining children in the school system upto Class VIII. These include measures like the ungraded school system at the primary stage, policy of 'no detention' till class VIII but with comprehensive evaluation, multiple-point entry in formal schools, introduction of play-way methods in Class-I—II with the adoption of dynamic teaching, teacher improvement and, above all, reform of primary curriculum including socially useful productive work, recommended by the Ishwarbhai Patel Committee. These measures, when implemented, would enhance the holding power of the primary and middle schools.

Free & Compulsory Education. The Constitution provides for free and compulsory education till the age of 14. The States are trying to implement this provision, as best they can.

Education in classes I-V is already free in Government, local bodies and aided schools in all parts of the country. It is also free in classes VI-VIII in all States/Union Territories except for boys in Orissa and Uttar Pradesh. The latter are presently considering the question of extending free education facilities to boys at the middle stage.

Legislation for compulsory primary education exists in all States except Bihar, Manipur, Meghalaya, Nagaland, Sikkim and Tripura. Among the Union Territories, such legislation is in force in Andaman and Nicobar Islands, Chandigarh and Delhi. In Himachal Pradesh, the Act covers the entire elementary stage (classes I-VIII).

The problem of universalisation of elementary education is essentially a problem of nine States, namely, Andhra Pradesh, Assam, Bihar, Jammu & Kashmir, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal. These States together constitute about 74 per cent of the non-enrolled children.

Pre-school Education. A modest programme for Early Childhood Education has been proposed under the Sixth Plan by way of broadbasing the Universalisation of Elementary Education. Pre-schools, as adjuncts to primary and middle schools, in rural areas for children of the dis-advantaged sections, envisaged under the programme, also aim at enabling out-of-school girls to attend schools, thus removing significantly one of the cases for non-enrolment and drop-out. Under the Central sector, it is proposed to extend assistance to voluntary organisations for running such centres. An expert Group constituted by the Ministry during 1980 recommended several models for early childhood education and training of teachers needed for the programme.

Quality of Education. The main thrust for improving the quality of elementary education is in the State sector. Under Central initiative, quite a few innovative projects have been in operation to improve the school curriculum. Under such projects, relevant, interesting and useful curricula are being attempted on a decentralised basis in diverse social, economic, cultural and geographical areas of the country, within a broad national framework. These programmes are being assisted by UNICEF and implemented in conjunction with the States and Union Territories.

Secondary Education. Education is free up to the secondary stage in Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Andaman & Nicobar Islands, Arunachal Pradesh, and Lakshadweep. In government schools, secondary education is free in some States and Territories—Jammu and Kashmir, Nagaland, Dadra & Nagar Haveli and Pondicherry. Girls are given free education in Gujarat, Madhya Pradesh, Manipur, Orissa, Rajasthan, Tripura and Uttar Pradesh. Students belonging to the scheduled castes and tribes get free education all through in all the States and Territories. They are in addition provided with funds for books and other accessories and in certain States with free board.

Women's Education. The disparity between the education of boys and girls still persists in spite of the vast expansion of facilities for women's education since independence. There has, however, been significant expansion in the education of girls during the last 25 years.

Enrolment. According to the Fourth Educational Survey conducted in the country with 30th September, 1978 as the reference date, the total enrolment was 865.61 lakhs during 1978-79, or 65.90 per cent of the total population in the 6-14 age-group. The Working Group on Education and Culture (1980-85) has suggested modest and realistic targets of 180 lakhs additional enrolment by 1984-85 (110 lakhs at primary and 70 lakhs at middle stage) achieving 95 per cent and 50 per cent enrolments respectively at the two stages. Thus, it is expected that by 1984-85 the total enrolment at the elementary stage (classes I-VIII) would be 1089 lakhs or 77 per cent.

The present number of non-enrolled children is of the order of about 450 lakhs. By 1984-85, this may come down to about 315 lakhs.

The vast majority of out-of-school children consists of children of the weaker sections like Scheduled castes, Scheduled tribes, agricultural labourers and slum-dwellers. Two-thirds of non-enrolled children are girls and three-fourths of them are in nine educationally backward States viz., Andhra Pradesh, Assam, Bihar, Jammu and Kashmir, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal. According to the Fourth Educational Survey, the enrolment of Scheduled castes and Scheduled tribes children in classess I-VIII was 119.68 lakhs and 49.54 lakhs respectively representing 60.10 per cent and 49.99 per cent respectively of the total Scheduled castes and Scheduled tribes in the 6-14 age-group population. The following table indicates the position and target of enrolment at the elementary stage:

Table 145

Enrolment

	1950-51	*1978-79*	*(Provisional) 1979-80*	*(Target) 1984-85* (In lakhs)
Age-group 6—11				
Enrolment: Classes I—V	191.55	686.00	722	832
Enrolment as percentage of age-group population	42.6	81.65	83.4	95
Age-group 11—14				
Enrolment: Classes VI—VII	31.20	179.60	187	257
Enrolment as percentage of age-group population	12.7	37.94	38.4	50
Age-group 6—14				
Enrolment: Classes I—VIII	222.75	865.60	909	1089
Enrolment as percentage of age-group population	32.4	65.90	67.2	77

NCERT The National Council of Educational Research and Training (NCERT), which was established in 1961, assists the Union Ministry of Education in the formulation and implementation of its policies in school education. The Council works in co-operation with state education departments and universities and with other institutions for promoting school education. It also maintains close contacts with international organisations. The results of the investigations conducted by the Council are made available to the public through books, journals and other literature. The Council runs four regional Colleges of Education at Ajmer, Bhopal, Bhubaneswar and Mysore. The Council is developing new curricula and syllabi for classes I to XII in the new (10+2+3) pattern of education.

CBSE. The Central Board of Secondary Education (CBSE), New Delhi, has introduced the new pattern of education from 1975. The first examination for Class X took place in 1977 and that of Class XII in 1979. The total number of institutions affiliated to the Board was 1354 (1980).

The Ministry of Education has entrusted the Board with the conduct of Merit Scholarship Examinations for placement of children belonging to the weaker sections in the approved Residential Schools all over the country. The All India Merit Scholarships Examination 1980, was held at 21 centres in the country. The number of students who registered for this examination was 1677.

Kendriya Vidyalaya Sangathan. The scheme of Central Schools was approved by the Government of India in November, 1962 with the idea of encouraging the growth of Secondary Schools having a common syllabus and medium of instruction and for providing uniform educational facilities throughout the country for the children of transferable Central Government employees including Defence personnel. Thus as a first step towards implementing this scheme, 20

Regimental schools were taken over and redesignated as 'Central Schools' or 'Kendriya Vidyalayas' during the academic year 1963-64. The number of Kendriya Vidyalayas has since gone up phenomenally and was 366 during 1981-82. The total student enrolment as on April 30, 1981 was 251,848 as against 224,203 a year before showing an increase of 9%. The total number of teaching and non-teaching staff in all the Kendriya Vidyalayas was 15,478.

The Kendriya Vidyalaya Sangathan is at present divided into 11 regions located at Bhopal, Bombay, Delhi, Chandigarh, Gandhinagar, Gauhati, Lucknow, Madras, Patna, Calcutta and Hyderabad. Each Regional Office is under the charge of an Assistant Commissioner who is assisted by an Educational Officer, a Superintendent and other ministerial staff.

The Sangathan has been making concerted efforts to improve the professional competence of all categories of teaching and supervisory staff in Kendriya Vidyalayas by organising in-service education courses for them. The Kendriya Vidyalayas are continually striving to emerge as model institutions where one can look for academic excellence. Towards this goal, many educational reforms have been adopted which range from improving instructional techniques to evaluation procedures.

NAEP. The National Adult Education Programme inaugurated on Oct. 2 (Gandhi Jayanti Day) 1978 is a frontal assault on the citadel of illiteracy in India. According to 1980 estimates there are no less than 230 million persons above the age of 15 who cannot read or write. The NAEP aims at covering at least 65 million illiterates in the 15-35 age group in about 5 years, that is by 1983-84.

Voluntary agencies are to be entrusted with the primary responsibility of working the programme. Development Blocks will form the basic territorial units for the programme. The Block headquarters will be the radiating centre. Each centre is to be organised by an instructor who will be paid a nominal salary of Rs. 50 per month.

It is one thing to impart literacy, quite another thing to keep literacy alive among the impartees. It is probably in view of this contingency that the programme has been made to cover a four-fold objective. The objectives are: (i) Literacy with assured follow-up, (ii) conventional functional literacy supportive of a dominant development programme; (iii) literacy with learning-cum-action groups and (iv) literacy for the formation of organisations of the poor.

As a result of the special efforts made during the current year to mobilise voluntary agencies for taking up adult education programmes, it is expected that by the end of the current financial year the number of voluntary agencies approved for assistance would reach about 500 involving over 20,000 centres with an enrolment in these centres of approximately 5 lakhs.

Progress of NAEP. The Review Committee appointed by the Union Government to assess the achievements of the NAEP reported in May 1980 that the working of the plan had not come up to the mark. The report pointed out "The results achieved so far, though limited in scale, are sufficient to generate confidence in the future of a massive progrmme of adult education"

Higher Education. Higher education in India is imparted through several colleges in arts, sciences, medicine, engineering, technology, law, education etc. The universities function as the focal centres of higher education.

The University Grants Commission, constituted in 1953, promotes and co-ordinates university education in India and maintains standards of teaching, examination and research in the universities.

The University Grants Commission is overhauling the present examination system.

According to a UGC source, the new system has three basic components: gradual replacement of external examination by internal assessment based on continuous sessional evaluation, creation of a network of question banks, and adoption of a grading system in place of the prevailing marking system.

In accordance with an action plan drawn up by the UGC, 41 universities, 15 agricultural and technological universities and seven institutions deemed to be universities have already adopted continuous sessional evaluation at various levels. Some of them have done so on an experimental basis.

Under the existing system, a student is tested at the end of the academic term and writes essay-type answers in three hours. Those three hours become most crucial for him as his whole performance is judged during this span of time.

The need for a different system was felt way back in 1964. The education commission said in its report submitted that year, " a system of internal assessment should be introduced as a supplement to the external examination, based on such periodical evaluations".

The result of these internal assessments should be separately indicated on the mark sheet and not mechanically added to the external marks.

Growth of Universities in India. The first modern universities were established in India in 1857 in the Presidency towns of Bombay, Calcutta and Madras. In 1948 there were only 21 universities in the whole of India. In 1977-78 there were 105 universities and 10 other institutions deemed to be universities.

The enrolment in universities and colleges increased from 26.5 lakhs in 1979-80 to 27.5 lakhs in 1980-81. The percentage of increase was 3.9 against 1.2 in 1979-80. However, it was below the average annual growth rate of 4% registered during the decade 1970-71 to 1979-80.

Indian Universities and Institutions deemed to be Universities 1981-82

1. Agra University, Agra
2. Aligarh Muslim University, Aligarh
3. University of Allahabad, Allahabad
4. Andhra University, Waltair
5. Annamalai University, Annamalainagar
6. Avadh University, Faizabad
7. Awadhesh Pratap Singh University, Rewa
8. Banaras Hindu University, Varanasi
9. Bangalore University, Bangalore
10. The M.S. University of Baroda, Baroda
11. Berhampur University, Berhampur
12. Bhagalpur University, Bhagalpur
13. Bhavnagar University, Bhavnagar
14. Bhopal Vishwavidyalaya, Bhopal
15. University of Bihar, Muzaffarpur
16. University of Bombay, Bombay
17. Bundelkhand University, Jhansi
18. University of Burdwan, Burdwan
19. University of Calcutta
20. University of Calicut, Calicut
21. University of Cochin, Tripunithura
22. University of Delhi, Delhi
23. Dibrugarh University, Dibrugarh
24. Garhwal University, Garhwal
25. Gauhati University, Gauhati
26. University of Gorakhpur, Gorakhpur
27. Gujarat Ayurved University, Jamnagar
28. Gujarat University, Ahmedabad
29. Gulbarga University, Gulbarga
30. Guru Nanak Dev University, Amritsar
31. Himachal Pradesh University, Simla
32. University of Hyderabad, Hyderabad
33. Indira Kala Sangit Vishwavidyalaya, Khairagarh
34. University of Indore, Indore
35. University of Jabalpur, Jabalpur
36. Jadavpur University, Calcutta
37. University of Jammu, Jammu (Tawi)
38. Jawaharlal Nehru Technological University, Hyderabad
39. Jawaharlal Nehru University, New Delhi
40. Jiwaji University, Gwalior
41. University of Jodhpur, Jodhpur
42. Kakatiya University, Warangal
43. University of Kalyani, Kalyani
44. K.S. Darbhanga Sanskrit University, Darbhanga
45. Kanpur University, Kanpur
46. Karnataka University, Dharwar
47. Kashi Vidyapith, Varanasi
48. University of Kashmir, Srinagar
49. University of Kerala, Trivandrum
50. Kumaun University, Nainital
51. Kurukshetra University, Kurukshetra
52. Lalit Narayan Mithila University, Darbhanga
53. University of Lucknow, Lucknow
54. University of Madras, Madras
55. Madurai-Kamaraj University, Madurai
56. Magadh University, Bodh Gaya
57. Maharshi Dayanand University, Rohtak
58. Mangalore University, Mangalore
59. Manipur University, Imphal
60. Marathwada University, Aurangabad
61. Meerut University, Meerut
62. University of Mysore, Mysore
63. Nagarjuna University, Nagarjunanagar
64. Nagpur University, Nagpur
65. University of North Bengal, Darjeeling
66. North-Eastern Hill University, Shillong
67. Osmania University, Hyderabad
68. Punjab University, Chandigarh
69. Patna University, Patna
70. Perarignar Anna University of Technology, Madras
71. University of Poona, Poona
72. Punjabi University, Patiala
73. Rabindra Bharati University, Calcutta
74. University of Rajasthan, Jaipur
75. Ranchi University, Ranchi
76. Ravishankar University, Raipur
77. Rohilkhand University, Bareilly
78. University of Roorkee, Roorkee
79. Sambalpur University, Sambalpur
80. Sampurnanand Sanskrit Vishvavidyalaya, Varanasi

81. Sardar Patel University, Vallabh Vidyanagar
82. University of Saugar, Saugar
83. Saurashtra University, Rajkot
84. Shivaji University, Kolhapur
85. S.N.D.T. Women's University, Bombay
86. South Gujarat University, Surat
87. Sri Krishnadevaraya University, Anantapur
88. Sri Venkateswara University, Tirupati
89. Tamil University, Thanjavur
90. University of Udaipur, Udaipur
91. Utkal University, Bhubaneswar
92. Vikram University, Ujjain
93. Visva-Bharati, Santiniketan
94. Andrha Pradesh Agricultural University, Hyderabad
95. Assam Agricultural University, Jorhat
96. Bidhan Chandra Krishi Visva-Vidyalaya, Mohanpur
97. Birsa Agricultural University, Ranchi
98. Chandra Shekhar Azad University of Agricultural Technology, Kanpur
99. Govind Ballabh Pant University of Agriculture & Technology, Pantnagar
100. Gujarat Agricultural University, Banaskantha
101. Haryana Agricultural University, Hissar
102. Himachal Pradesh Krishi Vishva-Vidyalaya, Palampur
103. Jawaharlal Nehru Krishi Vishva-Vidyalaya, Jabalpur
104. Kerala Agricultural University, Trichur
105. Konkan Krishi University, Dapoli
106. Mahatma Phule Krishi Vidyapeeth, Ahmednagar
107. Marathwada Krishi Vidyapeet, Parbhani
108. Narendra Dev University of Agriculture & Technology, Faizabad
109. Orissa University of Agriculture and Technology, Bhubaneswar
110. Punjab Agricultural University, Ludhiana
111. Punjabrao Krishi Vidyapeeth, Akola
112. Rajendra Agricultural University, Samastipur
113. Tamilnadu Agricultural University, Coimbatore
114. University of Agricultural Sciences, Bangalore
115. All India Institute of Medical Sciences, New Delhi†
116. Dakshina Bharat Hindi Prachar Sabha, Madras†
117. Indian Institute of Technology, Bombay†
118. Indian Institute of Technology, Delhi†
119. Indian Institute of Technology, Kanpur†
120. Indian Institute of Technology, Kharagpur†
121. Indian Institute of Technology, Madras†
122. Indian Statistical Institute, Calcutta†
123. Postgraduate Institute of Medical Education & Research, Chandigarh†
124. Sree Chitra Tirunal Medical Centre, Trivandrum†
125. Birla Institute of Technology and Science, Pilani*
126. Central Institute of English and Foreign Languages, Hyderabad*
127. Dayalbagh Educational Institute, Agra*
128. Gandhigram Rural Institute, Madurai*
129. Gujarat Vidyapith, Ahmedabad*
130. Gurukula Kangri Vishwavidyalaya, Kangri*
131. Indian Agricultural Research Institute, New Delhi
132. Indian Institute of Science, Bangalore*
133. Indian School of Mines, Dhanbad*
134. Jamia Millia Islamia, New Delhi*
135. School of Planning and Architecture, New Delhi*
136. Tata Institute of Social Science, Bombay

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† Institutions of National Importance.
* Deemed to be Universities.

During 1981-82, four new Universities were established. These are: Jagannath Sanskrit University at Bhubaneswar (Orissa), Tamil University at Thanjavur (Tamilnadu), Sri Krishna Devaraya University at Anantapur (A.P.), and Vidya Sagar University at Midnapur (W. Bengal). Besides, on the recommendation of the Commission, two institutions were notified as 'deemed to be Universities' under Section 3 of the UGC Act during 1981-82. These are the Dayal Bagh Educational Institute, Agra, and Sri Sathya Sai Institute of Higher Learning, Prashanti Nilayam in Andhra Pradesh.

Research in Universities. Universities, by and large, cannot do much in the way of research since their attention is almost wholly taken up by formal teaching for Bachelor and Master degrees. Nevertheless, almost all universities have research departments in one faculty or another. Many, in fact, are doing quite well in research.

Table 146

List of Centres of Advanced Study with Areas of Specialisation and Year of Recognition, in Science

Subject	*Area of specialisation*	*Department*	*year of recognition*
Physics	Theoretical Physics and Astrophysics	Department of Physics & Astrophysics, Delhi University	1963
—do—	Radiophysics & Electronics	Institute of Radio-Physics & Electronics	1963
Chemistry	Chemistry of Textile Fibres and Dyes	Department of Chemical Technology	1963
—do—	Chemistry of Natural Products	Department of Chemistry, Delhi University	1963
Botany	Plant Morphology and Embryology	Department of Botany, Delhi University	1963
—do—	Plant Pathology and Mycology	Department of Botany, University of Madras	1963
Zoology	Cell Biology and Endocrinology	Department of Zoology, Delhi University	1963
—do—	Marine Biology	Department of Marine Biology, Annamalai University	1963
Geology	Himalayan Geology & Palaeontology	Department of Geology, Punjab University	1963
Mathematics	Pure Mathematics	Department of Mathematics, Bombay University (in collaboration with the Tata Institute of Fundamental Research, Bombay)	1963
Mathematics	Pure Mathematics	Department of Mathematics Punjab University	1963
—do—	—do—	Department of Mathematics, University of Madras and Ramanujan Institute of Mathematics, Madras	1967
Astronomy	Experimental Astronomy	Department of Astronomy and Nizamia Observatory, Osmania University, Hyderabad	1964
Biochemistry	Proteins, Lipids, Vitamins	Department of Biochemistry, Indian Institute of Science, Bangalore.	1968

Table 147

List of Centres of Advanced Study in the Humanities and Social Sciences

Name of the Centre	*Subject*	*Area of specialization*	*Year of recognition*
Department of Economics, Bombay University, Bombay-32	Economics	Public Finance and Industrial Economics	1963
Department of Economics, Delhi University, Delhi	—do—	Economics of Development and Economic History	1963
Gokhale Institute of Politics & Economics, Poona University	—do—	Agricultural Economics	1963
Department of Philosophy, Madras University, Madras	Philosophy	Advaita and Allied Systems of Philosophy	1964
Department of Sanskrit, Poona University, Poona	Sanskrit	Sanskrit Literature	1964
Department of Linguistics Annamalai University	Linguistics	Dravidian Linguistics	1963
Department of Education, M.S. University of Baroda, Baroda	Education	Education Research	1963
Department of History, Alligarh Muslim University	History	Medieval Indian History	1968
Department of Sociology, Delhi University	Sociology	Sociology	1968

146. RESEARCH

India has the third largest scientific manpower in the world and over 400 research institutions. It has spent around Rs. 40 billion on research since independence. Yet the contribution of Indian science to international science is practically nil. Even at lower levels where well known scientific principles may be advantageously put to use by practical technology, Indian scientists have been disappointing. As Dr. Atma Ram has pointed out, "The massive support which governments are giving to science is not so much for the pursuit of science for its own sake but in the hope of benefits that could accrue from such pursuit".

As far as scientific literature goes, much of what Indian scientists turn out is routine stuff and many of their contributions to science journals commonplace. In 1977 there were 10 countries with more than 5000 publishing scientists. Among them India ranked 8th with 8120 scientists. But numbers do not signify quality. One scientist estimates that the total contribution of Indian scientists to international science literature was not more than 0.3%. This is quite poor.

The world of Indian science is dominated by three academies. 1. *Indian National Science Academy, Delhi.* This is the Royal Society of India and the focal point for liaison with International Council of Scientific Unions. *2. The Indian Science Congress Association, Calcutta.* This is another godfather. *3. Indian Institute of Science, Bangalore,* is the third. This multiplicity of top organisations does not reflect scientific effulgence or ebullience but competition and strife among top-ranking scientists.

All scientific organisations in India are pyramidal in structure and functioning—'a satrap at the top controlling by strings the vassals below. The landscape of Indian science is dotted with such pyramids—agriculture, atomic energy, space, medical research etc, with less than a dozen satraps ruling their respective satrapies'[*]. Only those at the top get the limelight and the plums in the pudding while thousands of talented scientists labour like slaves in the dismal dungeons below.

Research Agencies[†]

The responsibility for research in India is shared among various councils, commitees and departments, all of them functioning under the aegis of the Central or State governments. Important among them are: The Council of Scientific and Industrial Research (CSIR), the Indian Council of Medical Research (ICMR), the Indian Council of Agricultural Research (ICAR), the Central Council for Research in Indian Medicine and Homeopathy, the National Committee on Environmental Planning and Co-ordination (NCEPC), the Department of Atomic Energy (DAE) and the Department of Space (DOS).

The CSIR controls thirty National Laboratories and Research Centres including two museums.

The Indian Council of Medical Research is mainly responsible for the co-ordination of research work in 22 national institutions and several regional institutes.

The Central Council for Research in Indian Medicine and Homeopathy, established as an autonomous body, is engaged in intensive research in the different fields in Ayurveda, Unani, Siddha and Homeopathy and Yoga. The Central Council has established 15 full-fledged research institutes and about 112 research units for carrying out multidisciplinary research in different parts of the country. The Council is devoting its attention towards drug standardisation and drug research and clinical research.

The Indian Council of Agricultural Research functions through a network of 30 National and Central scientific institutes, 21 Agricultural Universities and 52 all-India co-ordinating agencies and 4 Project Directorates.

Basic Research Governmental Bodies

1 Survey of India, Dehra Dun.
2 Botanical Survey of India, Calcutta.
3 Zoological Survey of India, Calcutta.
4 Geological Survey of India, Calcutta.
5 Central Water, Power and Irrigation Research Centre, Khadakvasla, Poona.
6 Indian Meteorological Department, New Delhi.

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[*] K. S. Jayaraman, Science Today, March 1979.

[†] For Research in Universities, see *Education,* supra

7 Indian Institute of Tropical Meteorology, Pune.
8 Indian Institute of Astrophysics, Kodaikanal.
9 Indian Institute of Geomagnetism, Bombay.
10 Forest Research Institute, Dehra Dun.
11 Anthropological Survey of India, Calcutta.

Other Institutions

1 Bose Institute, Calcutta
2 Birbal Sahni institute of Palaeobotany, Lucknow.
3 Indian Association for the Cultivation of Science, Calcutta.
4 Wadia Institute of Himalayan Geology, Delhi.
5 Maharashtra Association for the Cultivation of Science, Pune.
6 Raman Research Institute, Bangalore.
7 Physical Research Laboratory, Ahmedabad.
8 Shri Ram Institure for Industrial Research, Delhi.
9 Himalayan Zoological Park, Darjeeling.
10 Indian National Science Academy, Delhi.

Table 148

Central Institutions

I Laboratories

1 National Aeronautical Laboratory, Bangalore.
2 National Chemical Laboratory, Pune.
3 National Metallurgical Laboratory, Jamshedpur.
4 National Physical Laboratory, New Delhi.
5 Regional Research Laboratory, Bhubaneswar.
6 Regional Research Laboratory, Hyderabad.
7 Regional research Laboratory Jammu.
8 Regional Research Laboratory, Jorhat.

II. Institutes

1 Central Building Research Institute, Roorkee.
2 Central Drug Research Institute, Lucknow.
3 Central Electrochemical Research Institute, Karaikudi.
4 Central Electronics Engineering Research Institute, Pilani.
5 Central Food Technological Research Institute, Mysore.
6 Central Fuel Research Institute, Jealgora.
7 Central Glass and Ceramic Research Institute, Jadavpur.
8 Central Leather Research Institute, Madras.
9 Central Mechanical Engineering Research Institue, Durgapur.
10 Central Public Health Engineering Research Institute, Nagpur.
11 Central Road Research Institute, Delhi.
12 Central Salt and Marine Chemicals Research Institute, Bhavnagar.
13 Indian Institute of Experimental Medicine, Calcutta.
14 Indian Institute of Petroleum, Dehra Dun.
15 National Geophysical Research Institute, Hyderabad.
16 National Institute of Oceanography, Panaji (Goa).

Museums and other Institutions

17 Birla Industrial and Technological Museum, Calcutta.
18 Central Indian Medicinal Plants Organisation, Lucknow.
19 Central Mining Research Station, Dhanbad.
20 Central Scientific Instruments Organisation, Chandigarh.
21 Indian National Scientific Documentation Centre, New Delhi.
22 Industrial Toxicology Research Centre, Lucknow.
23 National Botanic Gardens, Lucknow.
24 Publications and Information Directorate, New Delhi.
25 Structural Engineering Research Centre, Roorkee.
26 Visvesvaraya Industrial and Technological Museum, Bangalore.

III. Co-operative Research Institutions

1 Ahmedabad Textile Industry's Research Association, Ahmedabad.
2 Automotive Research Association of India, Bombay.
3 Bombay Textile Research Association, Bombay.
4 Cement Research Institute of India, Ballabgarh.
5 Indian Jute Industries' Research Institute, Bangalore.
6 Indian Plywood Industries' Research Institute, Bangalore.
7 Silk and Art Silk Mills' Research Association, Bombay.
8 South Indian Textile Research Association, Coimbatore.
9 Tocklai Experimental Station, Jorhat.
10 Wool Research Association, Bombay.

Indian Council of Agricultural Research (ICAR)

The ICAR is an autonomous institution but since it is dependent on the Central government for funds it has to work in close association with the Central government. The Department of Agricultural Research and Education (DARE) of the Ministry of Agriculture and Irrigation was established in Dec. 1973 to ensure close collaboration between the ICAR and the government. The Dapartment (DARE) provides the necessary government linkages to the ICAR. That is to say, the DARE carries out such functions as may be necessary for the effective working of the ICAR. The Director General of the ICAR is also Secretary to the Government of India in the Department of Agricultural Research and Education (DARE).

The following is a list of ICAR institutions in India.

1 Indian Agricultural Research Institute, New Delhi 110012.
2 Central Rice Research Institute, Cuttack 753006.
3 Central Potato Research Institute, Simla 171001.
4 Central Tuber Crops Research Institute, Sreekariyam, Trivandrum 695017.
5 Sugarcane Breeding Institute, Lawley Road, Coimbatore 641007.
6 Indian Institute of Sugarcane Research, P.O. Dilkusha, Lucknow 226002.
7 Central Plantation Crops Research institute, Post Kudlu, Kasarkod 670124.
8 Indian Institute of Horticultural Research, 255 Upper Palace Orchards, Bangalore 560006.
9 Central Institute for Cotton Research, 151/A Ravi Shankar Shukla Marg, Civil Lines, Nagpur 440 001.
10 Cotton Technological Research Laboratory, Adenwala Road, Matunga, Bombay 400019.
11 Jute Agricultural Research Institute, 24-Parganas, P.O. Barrackpore 743101.
12 Jute Technological Research Laboratories, 12 Regent Park, Calcutta 700040.
13 Central Tobacco Research Institute, Rajahmundry 533101.
14 Indian Lac Research Institute, P.O. Namkum, Ranchi 834010.
15 Central Soil and Water Conservation Research and Training Institute, 218 Kaulagarh Road, Dehra Dun 248195.
16 Central Soil Salinity Research Institute, Karnal-132001.
17 National Bureau of Soil Survey and Land Use Planning, Nagpur 440006.
18 Indian Grassland and Fodder Research Institute, Gwalior-Jhansi Road, Jhansi 284001.
19 National Bureau of Plant Genetic Resources, IARI Campus, New Delhi 110012.
20 Central Institute of Agricultural Engineering, Additional A-Block, II Floor, Guru Tegh Bahadur Complex, T.T. Nagar, Bhopal 462003.
21 Indian Veterinary Research Institute, Izatnagar 243122.
22 Vivekananda Parvatiya Krishi Anusandhan Shala, Almora 263601.
23 National Dairy Research Institute, Karnal 132001.
24 Central Sheep and Wool Research Institute, P.O. Avikanagar 304501.
25 Central Marine Fisheries Research Institute, P.B. No. 1912, Vincent Road, Cochin 682018.
26 Central Inland Fisheries Research Institute, Barrackpore 743101.
27 Central Institute of Fisheries Technology, P.O. Matsyapuri, Cochin 682029.
28 Indian Agricultural Statistics Research Institute, Library Avenue, New Delhi 110012.
29 ICAR Research Complex for North-Eastern Hills Region, Amrit Bhavan, Shillong 793001.
30 Central Arid Zone Research Institute, Jodhpur 342001.
31 Central Agricultural Research Institute for Andaman and Nicobar Group of Islands, Port Blair 744101.
32 Central Staff College of Agriculture, Rajendranagar, Hyderabad 500030.

Defence R & D Organisation Establishments/Laboratories

1 Armament Research & Development Establishment (ARDE), Pashan, Pune-411021.
2 Explosives Research & Development Laboratory (ERDL), Pashan, Pune-411021.
3 Instruments Research & Development Establishment (IRDE), Raipur, Dehra Dun-248008.
4 Terminal Ballistics Research Laboratory (TBRL), Sector 30, Chandigarh-160020.
5 Proof & Experimental Establishment (PEE), P.O. Chandipur, Balasore-756025

6 Defence Research & Development Laboratory (DRDL), Kanchanbagh P.O. Hyderabad-500258.
7 Electronics & Radar Development Establishment (ERDE), PO Box No. 5108, High Grounds, Bangalore-560001.
8 Solid State Physics Laboratory (SPL), Lucknow Road, Delhi-110007.
9 Defence Electronics Research Laboratory (DERL), Chandrayangutta Lines, Hyderabad-500005.
10 Defence Electronics Applications Laboratory (DEAL), Raipur Road, Dehra Dun-248008.
11 Research & Development Establishment (Engineers) RDE(E), Pioneer Lines-Dighi, Pune-411015.
12 Snow & Avalanche Study Establishment (SASE), C/o 56 APO.
13 Defence Institute of Fire Research (DIFR), Nangal Raya PO, New Delhi-110046.
14 Combat Vehicles Research & Development Establishment (CVRDE), Avadi-Madras-600054.
15 Vehicles Research & Development Establishment (VRDE), Ahmed Nagar-414001.
16 Aeronautical Development Establishment (ADE), High Grounds, Bangalore-560001
17 Gas Turbine Research Establishment (GTRE), Suranjan Das Road, Post Box No. 1777, Bangalore-560075.
18 Centre for Aeronautical Systems, Studies and Analyses (CASSA), 263, Mahalakshmi Layout, Bangalore-560010.
19 Aero Bio Engineering Unit (ABEU), Indira Nagar, Bangalore-560038.
20 Naval Chemical & Metallurgical Laboratory (NCML), Naval Dockyard, Bombay-400023.
21 Naval Physical & Oceanographic Laboratory (NPOL), Naval Base, Cochin-682004.
22 Naval Science & Technological Laboratory (NSTL), Visakhapatanam.
23 Defence Science Laboratory (DSL), Metcalfe House, Delhi-110054.
24 Defence Materials & Stores Research and Development Establishment (DMSRDE), Post Box No. 320, Kanpur-208013.
25 Defence Metallurgical Research Laboratory (DMRL), Kanchanbagh, PO, DMRL, Hyderabad-500258.
26 Defence Laboratory (DL), Ratnada Palace, Jodhpur-342001.
27 Aerial Delivery Research & Development Establishment (ADRDE), Station Road, Post Box No. 51, Agra Cantt-282001.
28 Defence Research & Development Establishment (DRDE), Tansen Road, Gwalior-474002.
29 Defence Food Research Laboratory (DFRL), Jyothi Nagar, Mysore-570010.
30 Field Laboratory (FL), Post Bag No. 2, Tezpur (Assam)-784001.
31 Field Research Laboratory (FRL), C/o 56 APO.
32 Agriculture Research Unit (ARU), Defence ARU, Almora-263601.
33 Defence Scientific Information & Documentation Centre (DESIDOC), Metcalfe House, Delhi-110054.
34 Institute of Nuclear Medicines & Allied Sciences (INMAS), Probyn Road, Delhi—110007.
35 Defence Institute of Physiology and Allied Sciences (DIPAS), Delhi Cantt-110010.
36 Institute of Armament Technology (IAT), Sinhagad Road, Girinagar, Pune-411025.
37 Defence Institute of Work Study (DIWS), Landour Cantt, Mussoorie-248179.

Source: Directorate General of R & D, Ministry of Defence.

The National Committee on Environmental Planning and Coordination (NCEPC) has been constituted by the Government of India as the apex advisory body in all matters relating to environmental planning, coordination, protection and conservation. The main functions of the NCEPC include: environmental appraisal of major development projects relating to hydro-electric and thermal power generation, irrigation and industrial development; forest development; preparation of guidelines and, where necessary, legal measures for incorporating environmental safeguards in development planning; recommending appropriate environmental management techniques; promotion of environmental and ecological research in priority areas; promotion of environmental education and awareness and coordinating activities in the country in respect of environmental planning, legislation, research, training and action.

The NCEPC has two research wings, the Environment Research Committee

(ERC) and Man and Biosphere Committee(MAB). The Committee supports various research projects which are carried out by other research establishments in the country.

The Department of Atomic Energy (DAE) maintains the following research institutions: Bhabha Atomic Research Centre (BARC), Trombay, Reactor Research Centre, Kalpakam, Gauribidanaur Seismic Station, Bangalore, High Altitude Research Laboratory, Gulmarg, Nuclear Research Laboratory, Srinagar, Variable Energy Cyclotrone, Calcutta, Heavy Water plants in Punjab, Gujarat, Rajasthan, Tamil Nadu and Talcher, Nuclear Fuel Complex, Hyderabad, Atomic Power Plants at Tarapur, Rajasthan, Kalpakam and Narora, Tata Institute of Fundamental Physics, Bombay, Tata Memorial Centre, Bombay and Saha Institute of Nuclear Physics, Calcutta.

Department of Space (DOS). see S.147, *Space Programme*.

147. SPACE PROGRAMME

Indian Space Programme. The goals of the Indian space programme can be summed up as Satellite Communications and Resources Survey. All other activities are designed to contribute towards achieving these goals. Two important ISRO activities in this context were the Satellite Instructional Television Experiment (SITE) Programme (1975-76) and the Satellite Telecommunications Experiments Programme (STEP) (1977-79).

The Indian Space Research Organisation (ISRO) started in 1963 as a small launch facility for sounding rockets called the Thumba Equatorial Rocket Launching Station (TERLS) near Trivandrum, with a handful of people to man it. Today, ISRO employs nearly 10,000 people spread over its Vikram Sarabhai Space Centre (VSSC) in Trivandrum, the SHAR Centre in Sriharikota, the ISRO Satellite Centre (ISAC) in Bangalore and the Space Applications Centre (SAC) in Ahmedabad. ISRO's growth has been both quantitative and qualitative. The launching of Aryabhata (1975), Bhaskara (1979), Rohini-1 (1980) and Bhaskara-II (1981), all designed and developed in India, and the successful flight of SLV-3 (1980) are some of the accomplishments during the past 17 years. Aryabhata and the Bhaskaras were launched by Soviet Intercosmos Rockets from a Soviet Cosmodrome. Rohini (RS-1), launched by SLV-3, is the first Indian Satellite to be orbited by an Indian launch vehicle from Indian soil.

A fourth Indian satellite, an experimental communications satellite called the Ariane Passenger Payload Experiment (APPLE), has been launched on board the European Space Agency's (ESA) Ariane launch vehicle from Kourou, French Guiana, during mid-1981. Work on a fifth satellite, called SEO—II, and the development of advanced launch vehicles like the Augmented Satellite Launch Vehicle (ASLV) and the Polar Satellite Launch Vehicle (PSLV) for carrying heavier satellites into farther orbits, is making steady progress.

ISRO's activities include remote sensing for resources management, development and launch of sounding rockets for upper atmosphere and meteorological studies, development of various technologies for application in television, long-distance telephony, image processing and geodesy, aerodynamics, and aviation. Technologies developed by ISRO have been transferred to various industries.

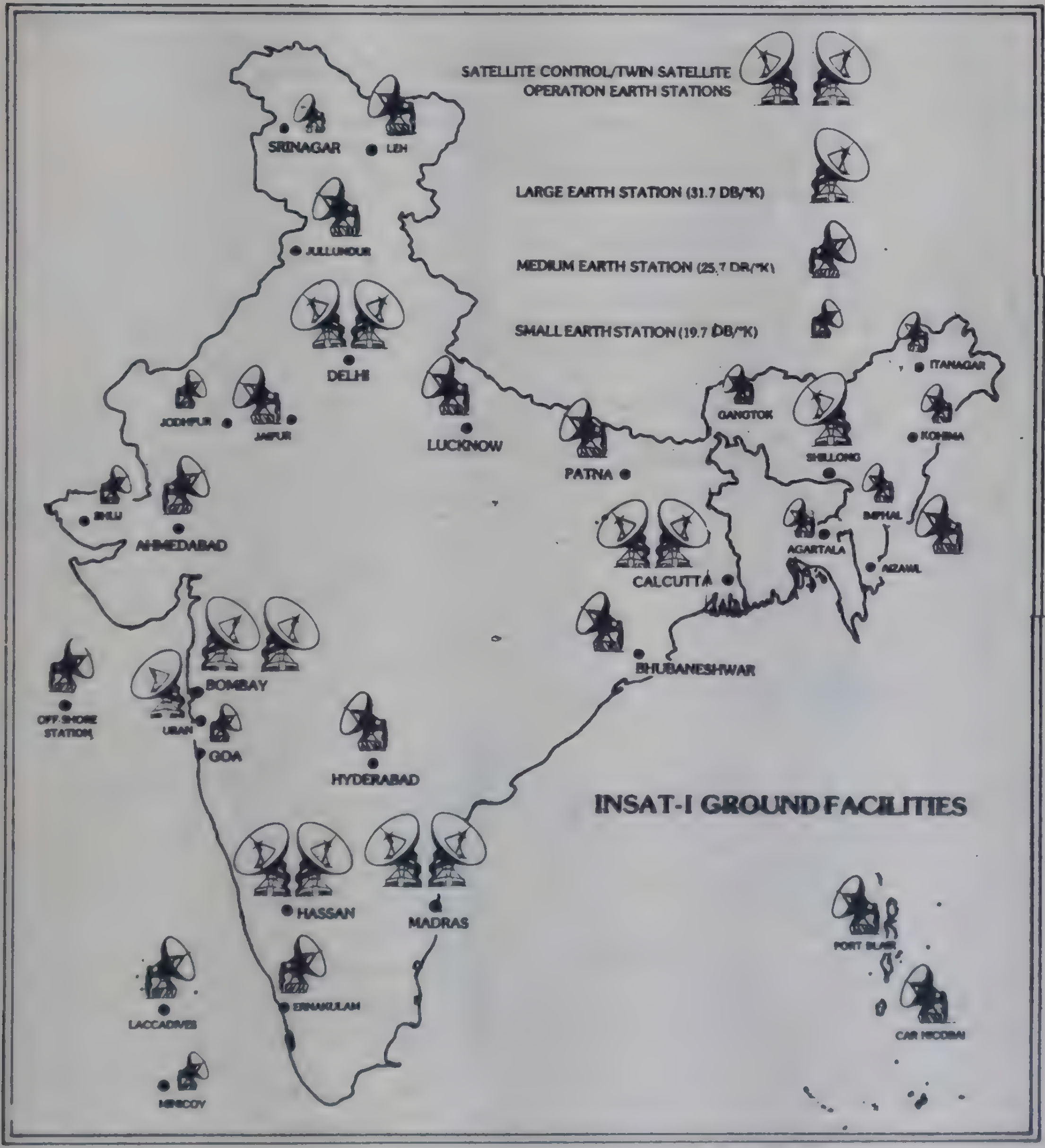
Work on the two first generation multi-purpose Indian National Satellites (INSAT-I), scheduled for launch during 1982-83, is progressing at the Ford Aerospace and Communications Corporation (FACC), USA. The INSAT-I Master Control Facility (MCF) being established at Hassan in Karnataka is expected to be ready by the second half of 1981.

A significant organisational event during the year was the transfer of the National Remote Sensing Agency (NRSA) at Secunderabad to function under the aegis of the Department of Space. (see further Special Feature *India in Space Club 1982 Year Book.*)

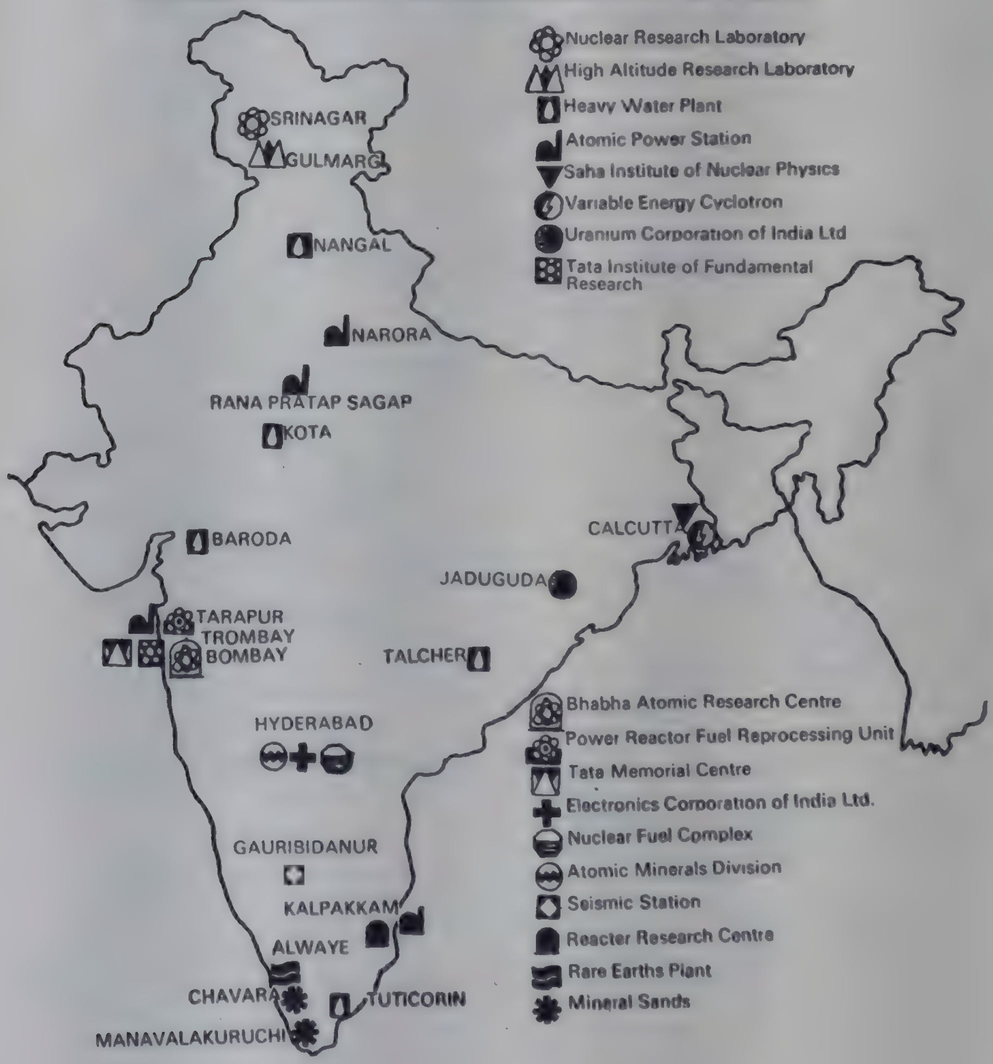
Bhaskara II. Bhaskara II, India's second earth observation satellite was launched from the Volgograd cosmodrome in the Soviet Union at 14 hrs IST on 20th November, 1981.

This was the third satellite to have been hurled into space from Volgograd cosmodrome, the other two being Aryabhata in April 1975 and Bhaskara I in June 1979.

Like its namesake predecessor, Bhaskara II carries a TV camera for infra-red and visible scanning of the land and a radio transmitter operating


INSAT-I GROUND FACILITIES

ATOMIC ENERGY ESTABLISHMENTS IN INDIA



at three frequencies for oceanographic studies.

The 436-kg Bhaskara II is far more sophisticated but slightly lighter than its predecessor. It was designed and fabricated entirely by Indian scientists.

It orbits the earth every 95 minutes, its maximum and minimum distances from the earth being 557 km and 512 km respectively.

Bhaskara I ended its mission on Aug. 1, 1981 after being in orbit for about 2 years.

The data received from Bhaskara II is expected to provide valuable information on the raw materials and mineral resources of the country, particularly deposits of coal, oil and gas. The data will also help India to determine flood-prone areas and in spotting forest fires.

On Dec. 16, 1981 Bhaskara II, India's second satellite for earth observation, has become "totally operational" with its primary payloads beaming back data.

The INSAT System. INSAT-I, the first generation Indian National Satellite System, under implementation is a multi-purpose operational satellite system for domestic telecommunications and meteorology with capability for nationwide direct TV broadcasting to rural communities and radio and TV programme distribution for rebroadcastingng/networking.

The overall management and coordination of the INSAT System, and the planning of future developments is achieved through the INSAT Coordination Committee (ICC) comprising the Secretaries of the concerned Departments, with the Secretary, Department of Space, as Chairman.

The initial INSAT I space segment consists of two identical multi-purpose satellites in geo-stationary orbit and a Master Control Facility (MCF) for satellite monitoring and management. The first satellite INSAT I A was launched in 1982 and the second satellite INSAT I B is to be launched in 1983. (see Box)

Box 54

INSAT I A FAILS

Bangalore, Sept. 6, 1982. The Indian National Satellite, Insat-I A, was turned off today.

All the systems of the multi-purpose satellite were closed and it could not work any more, an Indian Space Research Organisation (ISRO) source said here.

The satellite, plagued by recurring snags since it was launched on April 10, turned critically sick on Saturday when it suffered loss of altitude.

Efforts by the mission control to command the spacecraft to recover its altitude failed, bringing to a close its life just 150 days after launch.

Mr. P.P. Kale, project director, said the satellite was beyond redemption. All positions in the satellite had been "shut down" as the fuel had been completely depleted.

Eight out of the 20 Doordarshan centres will be deprived of the daily common national programme of 90 minutes duration. They are: Hyderabad, Sambalpur, Gulbarga, Bhuj, Raipur, Jaipur, Muzaffarpur and Nagpur.

Burden on Insat-IB:

Although Insat-IB is scheduled for launch next year, the country will have to decide whether to send a third satellite earlier than planned. The original plan was to keep the Insat-IB as a stand-by for Insat-IA and put new satellites into orbit in the early Nineties.

Now, the entire burden will have to be borne by Insat-IB, which will be without a stand-by until the launching of the third satellite.

—UNI

148. EMPLOYMENT

Full imployment is still a distant ideal for democratic countries, although socialist countries claim that they have found employment for all their citizens.‡ India despite its socialistic bias is still going around in circles to provide employment to its increasing work force. Actually what worries Indian policy makers is not as much the problem of employment as the problems of unemployment and under-employment.

Unemployment. The problem of unemployment has been growing over the last thirty years. It is strange that this should have happened in a planned economy. The Planning Commission has laid down for India a number of laudable goals and ambitious targets in various fields. But at no stage has it thought of full employment for the country's millions. The number of unemployed increased steeply from Plan to Plan. In the Third Plan, the Commission gave its estimate of the number of persons unemployed and conceded the fact that unemployment had grown during the first two Plan periods and left the matter at that. In the Fourth Plan document, the Commission has simply skipped the issue.

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‡ Providing work is one thing. Providing satisfying or remunerative work is another

A study of the growth of unemployment (1950-51 to 1968-69) made by the Reserve Bank says, "In none of the Plan periods, employment opportunities could be created on a scale to absorb even the new entrants to the labour force leading to progressively rising backlog of unemployed. All the same, the successive Five-Year Plans did succeed in providing jobs to a large proportion of labour seeking employment. For instance, during the First Plan, nearly 57 per cent of unemployed at the beginning of the Plan and new entrants to the labour force during the Plan got jobs. This proportion increased to slightly over 60 per cent during the Third Plan and then dropped to 47 per cent during Annual Plans"

It is not only open unemployment but disguised unemployment or under-employment also which has acquired serious dimensions in the country. The factors leading to this phenomenon are the low end poverty (low resource base of the self-employed), seasonal nature of agriculture and low growth in the secondary and tertiary sectors to absorb the rural and urban surplus labour. "The figures of under-employment, computable only for the 60's, are truly staggering—averaging 19 million on the basis of reported availability for more work and 58 million on the basis of a cut-off point of 42 hours of work per week"

As against this, the opportunities of gainful employment created during the first, second and third five-year plans were only seven million, 10 million and 14.5 million respectively and these were far less than the net addition made to the labour force which were nine million, 11.7 million and 17 million respectively. (Eastern Economist, May 20, 1977).

The policy prescriptions for the Fifth and Sixth Plans are guided by this experience. The objective is to provide vastly expanded job opportunities at reasonable income levels.

Employment Exchanges

The Employment Exchange organisation is the only agency in the country engaged in channelling the increasing work force into available vacancies. The total number of employment exchanges functioning in the country at the end of October 1981 was 660 as against 633 at the end of October, 1980. These included 71 University Employment Information and Guidance Bureaux, 15 Professional & Executive Employment Offices, 7 Colliery Exchanges, 10 Project Employment Exchanges, 21 Special Employment Exchanges for the Physically Handicapped and 1 Special Exchange for Plantation Labour. In addition, 208 Employment Information & Assistance Bureaux, to cater to the needs of rural areas, were also functioning in different Community Development Blocks.

The total number of work-seekers on the Live Register of Employment Exchanges showed a rise of 9.2 per cent from 159.53 lakhs in October, 1980 to 174.24 lakhs in October 1981. The total number of placements effected during the period January—October, 1981 was 4.11 lakhs as against 4.03 lakhs during the corresponding period of previous year, showing a rise of 2.0 per cent.

Educated applicants: The number of educated job-seekers (i.e. Matriculates and above) on the Live Register of Employment Exchanges continued to show a rising trend. It was 81.64 lakhs at the end of December, 1980 as against 72.97 lakhs at the end of December, 1979 showing a rise of 11.9 per cent. The number of educated job-seekers on the Live Register as on 31-12-1980 classified according to broad educational levels is shown below:—

Table 149

Educated unemployment

(in lakhs)

Educational Levels	The number of educated job-seekers on Live Register as on	
	31-12-79	31-12-80
	2	3
Matriculates	39.96	45.68
Under-graduates (including Intermediates and Higher Secondary)	18.82	20.71
Graduate and Post-graduates	14.19	15.24
Total	72.97	81.64

Women applicants. Women work-seekers on the Live Register at the end of October, 1981 were 26.66 lakhs as against 22.69 lakhs in October, 1980. During the period January-October, 1981 the number of placements effected in respect of women job-seekers was 50,615 as against 56,788 during January-October, 1980. The percentage increase in the number on Live Register in October 1981 over October 1980 works out to 17.5 per cent and there is a fall of 10.9 per cent in the number of placement effected in 1981 over 1980.

Number of establishments: The total number of establishments from which the information as collected was 2.02 lakhs as on 31st March, 1981(P). Of these, the Public Sector accounted for 1.08 lakhs and the remaining 0.94 lakh were in the Private Sector. The number of establishments coming under the purview of the Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959 was 1.48 lakhs.

Overall Employment Situation: The employment in the Organised Sector increased from 223.16 lakhs at the end of March, 1980 to 228.90 lakhs (Provisional) at the end of March, 1981 recording an increase of 2.6 per cent during the year 1980-81 in comparison to an increase of 0.3 per cent in the previous year.

Imbalances. Manpower imbalances are generally caused on account of the gap between requirements of the economy in terms of jobs on the one hand and the structure, composition and skills of the labour force available on the other. These imbalances occur owing to inadequate supply of the particular category of workers at the micro level. There are, however, instances wherein shortages have been reported in some specified occupations by the employers although a large number of applicants were found registered with the Employment Exchanges in those occupations. Such a situation sometimes arises due to unrealistic demands of employers in terms of qualifications, length of experience required and relatively low emoluments offered by them and also partly due to high and unrealistic expectations of job-seekers. Lack of mobility on the part of the job-seekers may also be a factor causing shortage.

A large number of unskilled workers and educated persons including Matriculates and above are found on the Live Register of Employment Exchanges and their number has been rising from year to year. Among the work-seekers, those having no training or work experience are generally found to be surplus all over the country. On the other hand, a large number of vacancies are cancelled for want of suitable applicants, which provides a rough indication of shortage in occupations. During the year 1979 a total of 35.58 thousand vacancies were cancelled by the Employment Exchanges for want of suitable candidates as against 35.93 thousand vacancies cancelled during the previous year. The highest percentage of such vacancies was under the category of Production Process and Related Workers and Transport Equipment Operators excluding labourers (33.4 per cent). This was followed by Professional, Technical and Related Workers excluding Teachers (26.9 per cent), Clerical & Sales Workers excluding Typists and Peons (11.4 per cent) and Teachers (4.6 per cent) etc.

149. LABOUR

Urban and Rural Labour

Workers in India fall into two major sectors, the urban sector and the rural sector. The urban sector is usually described as the organised sector and consists of workers in factories and other urban undertakings and those employed in mines, plantations and other organised businesses. The rural sector consists of agricultural workers and other workers in the rural areas. Urban or organised workers form only a numerically minor segment while the rural workers form the overwhelming majority of the total work force. Reliable statistics are available only about the workers in the organised sector while no such data are available about the rural workers. The term 'organised' is significant in that, that whatever advantage urban labour has over rural labour flows from the fact that urban labour is unionised while rural labour is not.

There is a clear relationship between the extent of unionisation of workers and the increase in their real wages. Thus it is not an accident that in the registered factory sector where the extent of unionisation has been high, the average annual money earnings of workers increased more than 3½ times (from Rs. 1202/- to Rs. 4357) between

1960-61 and 1976-77, and their *real earnings increased by 21 per cent*. The real earnings of mine workers have also risen substantially in recent years by 27 per cent between 1973 and 1976. On the other hand, according to the rural Labour Enquiry, the real earnings of rural workers engaged both in agricultural and non-agricultural occupations, who remain unorganised actually decreased by 10 to 18 per cent over the decade 1964-65—1974-75[*] "

Organised Sector

Factories. According to the Annual Survey of Industries 1977-78, 89 per cent of the factories comprised relatively small units employing less than 99 persons. These factories employed about 24 per cent of the total employees and produced about 24 per cent of the gross output of the factory sector. Their share in the national income generated was only 14.6 per cent. In contrast, the top 2.5 per cent of the factories employing 500 or more persons accounted for nearly 54 per cent of the total factory work force and contributed nearly 53 per cent of the gross output. It would therefore appear that small industries despite their dominating number are poor national assets both from the point of view of employment as well as of output.

Mines and Plantations. Workers in these sections of the organised sector are taken care of by special laws enacted for mines and plantations. Consolidated statistics on these workers are not available.

Bonus

The bonus law has been changed several times in the last six years. In September 1972, the Bonus Act was amended by a Presidential Ordinance. The statutory minimum of 4 per cent was raised to 8½ per cent as from 1971. The minimum was to be paid whether the company concerned made a profit or not. On September 25, 1975 the Bonus Act was again amended by another Presidential Ordinance which restored the old statutory minimum of 4 per cent and linked bonus to profits on the one hand and productivity on the other. The Ordinance was replaced in 1976 by the Payment of Bonus (Amendment) Act of 1976 which came into operation as and from Sept. 25, 1975, the date of the Ordinance.

On Sept. 3, 1977 the Janata government issued an Ordinance restoring the minimum of 8½% from the accounting year 1976, irrespective of loss or profit to the establishment concerned. The Ordinance was later enacted as the Payment of Bonus (Amendment) Act, 1977.

Payment of Bonus (Amendment) Act, 1977 was further amended by the Payment of Bonus (Amendment) Ordinance, 1979 on the 30th August, 1979 with a view to maintaining the *status quo* in respect of the accounting year commencing on any day in the year 1978. The Ordinance was replaced by the Payment of Bonus (Amendment) Act, 1980.

The Payment of Bonus Act was further amended by the Payment of Bonus (Amendment) Ordinance, 1980 on the 21st August, 1980 so as to provide, in particular, for payment of minimum bonus at the rate of 8.33 per cent of wages or Rs. 100 (Rs. 60 in the case of employees who have not attained the age of 15 years), whichever is higher, as a permanent feature of the Act. The Ordinance was replaced by the Payment of Bonus (Second Amendment) Act of 1980 which was passed by Parliament in December, 1980

Labour Situation. There has been some increase in the number of incidents of labour unrest as also an increase in violent actions during 1981 as compared to the previous years as would be seen from the following table:

Table 150

Year	Total No. of incidents	% of violent incidents
1977	6,258	11.6%
1978	6,666	12.6%
1979	4,353	15.7%
1980	3,028	17.9%
1981	4,182	18.9%

Inter-union rivalries and united action by certain trade unions and service federation have contributed to creating a climate of distrust and indiscipline adversely affecting industrial production. Some of the trade unions gave a call for a countrywide strike on 19th January, 1982. Adequate steps were taken on that day to ensure maintenance of law and order and essential services and to instil a sense of security in those who did not want to participate in the strike. As a result there was by and large little disruption to normal life in the country.

Social Security

Social security benefits to industrial workers have been provided under the following Acts: The Workmen's Compensation Act, 1923, the Employees State Insurance Act, 1948, the Employees' Provident Funds and Miscellaneous Provisions Act, 1952, the Maternity Benefit Act, 1961 and the Payment of Gratuity Act, 1972.

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[*] Naval H Tata in Economic Times

Unorganised Sector

Workers in this sector are all confined to the rural areas where they are mostly engaged in agricultural work. The estimated work force in the rural areas in 1978-79 was 216.16 million compared to 44.76 million in urban areas. Out of the 216.16 million rural workers, 192.43 million were estimated to be employed in agricultural work. The remaining 23.73 million were engaged in non-agricultural occupations*.

Bonded Labour. A special problem affecting rural workers is 'Bonded Labour'. These are agricultural workers bound to work for a landlord—and no other—all their lives for whatever pittance they get as wages. Bondage always begins in money or foodgrains borrowed from the landlord to meet some emergency or simply to stave off starvation. The bonded workers are in fact working to pay back their debts—which never happens.

Under the Twenty-Point Programme all states have passed legislations abolishing bonded labour and cancelling all debts payable by bonded workers. The problem now is to implement these laws and to rehabilitate the bonded workers who have been freed from their debts. The powers for enforcement of the Bonded Labour System (Abolition) Act, 1976 rest with the State Governments.

The latest reports received from the State Governments which are primarily concerned with the implementation of the Act, reveal that of the 1,20,971 bonded labourers who were identified and freed, 1,03,707 have been rehabilitated so far. During 1980, for the rehabilitation of 13,995 bonded labourers, a sum of Rs. 131.54 lakhs was released to the State Governments as matching grant. The Planning Commission recommended an outlay of Rs. 25 crores for the Sixth Five-Year Plan 1980-85 and Rs. 3.25 crores for the Annual Plan 1981-82. The State Governments have been advised to complete the task of rehabilitation of the remaining 17,264 bonded labourers so far identified and freed by March, 1982. They have also been requested to take effective steps, including conduct of periodic surveys in susceptible areas, to identify, free and rehabilitate bonded labourers, wherever found existing.

Box 55

16.25 m Children engaged in work

Minister of State for Labour Ram Dulari Sinha told the Lok Sabha that according to a national sample survey, the number of working children as on March 1978 was estimated at 16.25 million.

Replying to Mrs. Usha Prakash Chaudhari, she said tea gardens, cashew processing units, beedi and match industries and hotels were some of the places where child labour was engaged.

According to a labour bureau survey, children were forced to work for more than 40 hours a week on plantations and about six to eight hours a day in factories.

She said their wages on tea plantations varied from 99 paise to Rs. 3.50 a day. In Tamil Nadu and Maharashtra, their wages varied from Rs. 1.22 to Rs. 5 a day.

Mrs. Sinha said a Central advisory board had been constituted to protect the interest of working children. The board met on March 31, 1980 and had split into three groups. They would be visiting various plantations and submitting their reports.

The Government would take further action on the basis of these reports.

New Delhi, May 6, 1981 (UNI)

Minimum Wages

The Minimum Wages Act of 1948 empowers the appropriate governments, that is, the Central or State governments, to fix minimum wages for all classes of employment and to review them at intervals not exceeding 5 years.

A meeting of State Labour Secretaries on April 18, 1980 emphasised the need for revision of minimum wages once in two years, where the wage rates were not linked to the consumer price index and also where the wage rates were very low. It was also agreed that the machinery for the enforcement of minimum wages must be further strengthened.

In 1980-81 the minimum rates of

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* Ministry of Labour, Report 1979-80

wages have been further revised for workers employed in (i) agriculture, (ii) various mines, (iii) construction or maintenance of roads or in building operations, (iv) stone breaking and stone crushing, (v) maintenance of buildings and (vi) construction and maintenance of runways. Proposals for further revision of the minimum rates of wages are under consideration.

150. HEALTH

Though Public Health is a State subject, the Central Government plays a vital role in health programmes. The broad objectives of the health programmes in the last decade have been to control and eradicate communicable diseases, to provide preventive and curative health services in rural areas and generally to improve the standard of health of the people at large.

Medical Systems

There are two main systems of medicine in India, (1) The Allopathic or the Western system and (2) The Ayurvedic or the Indian system. The Unani system and the Homeopathic system are two other systems which are popular in India. The Unani system is, in fact, the Arabic system introduced in India during the days of the Muslim Sultanates. This is now considered a branch of the Indian system. The Homeopathic system has recently been recognised by the Government, under the Homeopathy Central Council Act, 1973.

Medical Organisations

Medical Council of India. This was established under the Indian Medical Council Act 1956 for the maintenance of uniform standards of Allopathic medical education in the country. The Council maintains the Indian Medical Register. The number of doctors borne on the Register as on December 31, 1980 was 261,323.

The Dental Council of India, established under the Dentists Act, 1948, regulated the profession of dentistry. The council maintains a register of dentists.

The Pharmacy Council of India, established under the Pharmacy Act, 1948 regulates the education and training of pharmacists.

The Indian Nursing Council, formed under the Indian Nursing Act, 1947, regulates and maintains a uniform standard of training for nurses, midwives and health visitors. It maintains the Indian Nursing Register which contains the names of all the nurisng personnel.

The Central Council of Indian Medicine was formed in Sept. 1971 to supervise education in and the practice of Indian medicine. It prescribes the minimum standards of education in Indian medicine and maintains an All India Register of Practitioners of the Indian System of Medicine (ISM).

The Central Council of Homeopathy was set up in Aug. 1974 under the Homeopathic Central Council Act, 1973. The Council determines the minimum standards of homeopathic education throughout India and maintains a Central Register of Homeopathic practitioners.

Medical Research

The Indian Council of Medical Research initiates, develops and co-ordinates medical research in the country. It is financed mainly by the Government of India. The research programmes of the Council are carried out through its 15 permanent institutes, semi-permanent units, a number of national multicentric collaborative projects, and a large number of time-bound research schemes undertaken by experts in the concerned fields in medical colleges, research institutes and universities all over the country.

A Central Council for Research in Indian Medicine and Homeopathy established during 1969 is responsible for initiating, conducting and co-ordinating scientific research in different aspects—fundamental and applied—of the Indian Systems of Medicine, Homeopathy and Yoga. The Council has 15 full-fledged research institutions and about 115 research units for carrying out multi-disciplinary research.

Health Situation

A Committee jointly sponsored by the Indian Council of Social Science Research and the Indian Council of Medical Research have in their report "Health for All—An Alternative Strategy" reviewed the progress of health in the country. They say that "the overall picture is a mixture of light and shade, of some outstanding achievements, whose effect is unfortunately more than offset by grave failures."

"There has been a steady decline in death rate from 27.4 in 1941-51 to an estimated 15.2 in 1971-81. This has naturally resulted in a corresponding increase in the expectation of life at birth.

Half a century ago, an average Indian could at birth expect to live only for 26 years. Today he can look forward to a life span of 50 years. This is an achievement indeed."

As against this achievement "morality rates among women & children are distressingly high....Infant mortality rate is still about 120 per thousand live births. This is far higher than in Sweden (9), USA (16), UK (17), Thailand (27), and Sri Lanka (45). Similarly the mortality rates among female children and among women of child bearing age are very high, the maternity mortality rate being as high as 418 per 100,000 live births. Consequently, we have an adverse sex ratio and it has become even more unfavourable to women over the last 30 years."

"The current morbidity and mortality picture shows one major variation from the past. Famines no longer take the toll they used to, small pox has been eradicated, cholera and malaria have been curbed and immunization has protected children from dangerous childhood diseases like whooping cough, diphtheria, tetanus and polio. But in other respects, the overall character of morbidity has not changed much. Diseases arising from poverty, ignorance, malnutrition, bad sanitation, lack of safe water supply, drainage or adequate housing and low levels of immunity are still the most common.... It appears that although the average Indian may now live longer his morbidity is only marginally less than that of his forefathers...."

"In both morbidity and mortality there are large variations from state to state (eg. between a death rate of 7.2 per cent per 1000 population in Kerala and a death rate of 19.2 per cent in U.P.) and even within a state, there may be variations. The differences between rural and urban areas are also very large and on the whole the health situation in rural areas is more dismal."

Communicable Diseases

The Central government pays special attention to the major communicable diseases and has worked out national programmes in regard to them.

Small pox. The small pox eradication scheme was started in 1962. By 1977 incidence of small pox was reduced to zero in India. On April 23, 1977 an International Assessment Commission declared India to be free of small pox.

Malaria. Malaria has been a major public health problem in India from ancient times. It was estimated that about 75 million people suffered from disease in a normal year and twice the number during epidemics with an annual mortality rate estimated to be about 0.8 million as a direct result of malaria.

To combat this major public health problem, the National Malaria Control Programme was launched in April, 1953 which was upgraded to National Malaria Eradication Programme in 1958. This achieved remarkable success during the period 1958 to 1965 by which time the incidence of malaria came down to only one lakh cases in 1965 and no deaths during the year.

Since 1965, however, there was an upsurge in the incidence of malaria, both of the normal type and of the *P. falciparum* variety, due to a number of factors including development of resistance to certain insecticides in some sectors, emergence of resistance to chloroquine drug by malaria parasite in some parts of the country, inadequate supply of appropriate type of insecticide, large price increases in insecticides, inadequate allotment of funds for the malaria programme, specially for the maintenance phase which were the responsibility of the States, etc. In 1976, the incidence of malaria rose to a peak of 6.47 million (of which 742,247 were of *P. falciparum* of malaria) with 59 deaths.

While the overall picture is not unsatisfactory from the incidence point of view, the progress is not uniform throughout the country and in several States/Union Territories, the incidence of malaria has increased in 1980 as compared to the corresponding periods of 1979. These include Gujarat, Himachal Pradesh, Madhya Pradesh, Nagaland, Andaman & Nicobar Islands, Chandigarh, Coal Fields area, Dadra and Nagar Haveli and Pondicherry. Similarly, in respect of *P. Falciparum* type of malaria, there has been an increase in the incidence during 1980, as compared to the corresponding period for 1979, in Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Nagaland, Punjab, Rajasthan, Tripura, Uttar Pradesh, West Bengal, Andaman & Nicobar Islands, Chandigarh, Dadra & Nagar Haveli and Pondicherry. Special attention is being paid to the anti-malaria effort in these Union Territories/States to improve the situation.

Filaria. Filariasis is a major Public Health problem in India. All the States except Jammu & Kashmir, Haryana, Chandigarh, Himachal Pradesh, Punjab, Delhi, Rajasthan, Manipur, Tripura, Nagaland, Arunachal Pradesh, Sikkim and the North Eastern region are endemic to filariasis. As per the present estimates, about 236 million population is living in the known endemic areas of which 62 million is in urban areas and 174 million in rural areas.

For the control of filariasis, the National Filaria Control Programme was launched in 1955. It operates in two spheres—urban and rural.

(I) Urban: At present, 171 filaria control units are functioning in as many towns for the control of filariasis. The control activities are confined mainly to recurrent antilarval operations. These units are protecting a population of over 24 million. Also 83 filaria clinics are functioning in the areas under control for detection and treatment of microfilaria carriers to reduce the reservoir of infection.

(II) Rural: There is at present, no viable control programme for filariasis which will be effective in rural environment. An experimental project has been taken up since 1977 in 3 selected rural areas in 3 districts—one each in Andhra Pradesh (Srikakulam), Gujarat (Bulsar) and Uttar Pradesh (Jaunpur). It is hoped that when these schemes are completed by 1985 it would be possible to evolve a viable method of control of filariasis in rural areas.

Leprosy. Leprosy is one of the major public health problems in India. The disease spreads mainly by close contacts with infectious patients. The disease is protracted in nature causing deformities if detected and treated late.

The National Leprosy Control Programme was launched in the year 1955 by the Government of India in close collaboration with the State Governments to control the spread of the disease and to render modern treatment facilities to leprosy patients. The Control Programme is a Centrally Sponsored Programme and the activities are implemented through the respective States' Health Directorates, by establishment of Leprosy Control Units/Centres, Temporary Hospitalization wards, Reconstructive Surgery Units, etc., as per targets assigned to them.

According to the 1971 census, about 379 million population in 31 States/UTs lived in endemic zones of leprosy. Out of this, on the basis of data of leprosy infection then available, it was estimated that 3.2 million patients were in India. About 25 per cent of these patients were estimated to be in an infectious stage and about 25 per cent were suffering from various deformities. It was also estimated that about 4 lakh patients were socio-economically dislocated and of these about 2 lakh patients had become floating beggars. Of the total leprosy-affected persons, about 15 per cent were estimated to be children upto 14 years of age. It is estimated that the present population of leprosy-affected persons may be about 4 million and that this is larger in proportion to the total number of leprosy-affected persons of the world than India's share of world population.

Cholera. Case fatality of cholera has decreased during the year 1980 as compared to the previous year 1979. During the year 1980 (upto 15-11-1980), 5963 cases with 177 deaths were reported while during the year 1979, 5638 cases occurred with 312 deaths.

During the year 1980-81 the strategy of Cholera Control Programme has undergone change. Oral rehydration has been introduced on a massive scale. This year, short-term training courses on oral rehydration therapy are being conducted at different places in India with WHO assistance.

Oral rehydration therapy has proved effective in the control of Cholera & other Diarrheal Diseases. Sufficient quantities of oral rehydration powder are being manufactured in India. This is available on low cost at the Medical Store Depots.

Tuberculosis. Tuberculosis is a major Public Health Problem in India. It is estimated that nearly 1.5 per cent of the population is suffering from radiologically active T.B. disease, of which nearly ¼ are sputum-positive or infectious

To tackle the problem of tuberculosis in the country, under the National TB Programme, fully equipped and staffed District TB Centres to undertake TB case finding and treatment activities are being established in each of the districts of the country. So far, a total of 353 District TB Centres have been established. In addition there are about 300 TB Clinics which also undertake domiciliary treatment of the TB patients. 17 TB Training & Demonstration Centres for training medical & Para-medical personnel have been established so far. A total of nearly 44000 TB beds for the in-patient treatment of the seriously sick have been established in the country so far.

STD

The term Sexually Transmitted Diseases and its abbreviation STD is now preferred to Venereal Diseases (VD). According to a WHO survey, 200 million people suffer from STD in the world. Roughly 20 million of them are in India. In these days of permissiveness the incidence of STD among teenagers—boys & girls between the ages of thirteen and nineteen—has become a worldwide problem. It is found that teenagers form the second biggest group of STD patients in India. The biggest group comprises persons in the 20-30 age group.

"Popularisation of family planning methods has almost eliminated the fear of pregnancy. That being so, it is logical that sexual promiscuity should be on the rise, the inevitable result being a rise in STD. That is the price a permissive society has to pay."

According to Dr. Rao, the causative agents of STD have no natural extra-human biological existence. It should therefore be possible to control these diseases by controlling the human carriers. The main difficulty in this matter is the unwillingness of persons to identify their partners in sexual activities.

Whatever the methods adopted to control these diseases, there must be enough medical facilities to fight them. Such facilities are "woefully inadequate" in India. There are just about 250 STD clinics in the country, some of them manned by ill-qualified medical personnel.

National Goitre Control Programme. The Goitre Cell in the Directorate General of Health Service identifies the goitre endemic regions of the country, ensures production and supply of iodised salt to endemic regions, and makes an assessment of the impact of the programme after 5 years continuous supply of iodised salt to endemic regions.

Control of Blindness. Blindness and Visual Impairment is a major socio-health problem in our country. To tackle the problem the Government of India had launched a National Programme for Prevention of Visual Impairment and Control of Blindness in 1976. The programme envisages to provide: (a) intensive educational efforts on eye care to the community; (b) temporary ophthalmic services to the remote rural areas through mobile ophthalmic units under a Crash Programme; and (c) the establishment of permanent infrastructure for eye health services at peripheral, intermediate & central levels of the existing public health delivery system.

Table 151

Medical Personnel

No. Regd. Doctors	235,631(1978)
No. of Homeopathic Practitioners	151,137
No. of Practitioners in Indian Medicine.	
Ayurveda	225,063(1978)
Unani	30454(1978)
Siddha	18128(1978)
Nurses	120,401(1977)
Midwives	118,533
Auxillary Nurse-midwives	55,656
No. of Regd. pharmacists	107,452

Premier Health/Medical Institutions

All India Institute of Medical Sciences—Master and Doctorate courses in medicine, pure and applied research in medicine, New Delhi.

All India Institute of Physical Medicine and Rehabilitation, Bombay.

All India Institute of Speech & Hearing, Mysore.

All India Institute of Hygiene and Public Health, Calcutta.

Central Drugs Laboratory, Calcutta—a statutory laboratory under Drugs & Cosmetics Act.

Central Indian Pharmacopoeia Laboratory, Ghaziabad—a statutory laboratory, under Drugs and Cosmetics Act.

Central Institute of Psychiatry, Ranchi—Research.

Central Leprosy Teaching and Research Institute, Chingleput, Tamil Nadu.

Central Research Institute, Kasauli—production of vaccines.

Central Health Education Bureau, New Delhi.

Central Council for Research in Ayurveda and Siddha, Ghaziabad.

Central Council for Research in Unani Medicine, Ghaziabad.

Central Council for Research in Homeopathy, Ghaziabad.

Central Council for Research in Yoga and Naturopathy, Ghaziabad

Central Council for Research in Homeopathy, New Delhi—teaching and practice.

Dr. Ram Manohar Lohia Hospital New Delhi—a teaching-cum-service hospital

Hoemopathic Pharmacopoeial Laboratory, Ghaziabad.

International Institute of Population Studies, Bombay—Research.

Jawaharlal Institute of Post-graduate Medical Education and Research, Pondicherry—affiliated to the University of Madras.

Kalawati Saran Children's Hospital, New Delhi.

Lady Hardinge Medical College, New Delhi.

National Institute of Communicable Diseases, New Delhi—Research.

National T.B. Institute, Bangalore—Research.

National Institute of Mental Health and Neuro-sciences, Bangalore—Research.

National Medical Library, New Delhi.

National Institute of Homeopathy, Calcutta—teaching and training.

National Institute of Health and Family Welfare, New Delhi—affiliated to Delhi University—degrees in public health.

Public Health Laboratory, Pune.

Postgraduate Institute of Medical Education and Research, Chandigarh-Nehru Hospital, attached.

Pasteur Institute of India, Coonoor, Nilgiris—vaccines.

Pharmacopoeial Laboratory for Indian Medicine, Ghaziabad.

Regional Cancer Research Centres

1. Calcutta 2. Madras 3. New Delhi 4. Tata Memorial Hospital, Bombay.

Rajkumari Amrita Kaur College of Nursing, New Delhi—Bachelor and Master degrees in Nursing.

Safdarjang Hospital, New Delhi—a teaching hospital for the University College of Medical Sciences, Delhi.

Sucheta Kripalani Hospital (women's hospital), New Delhi.

Serologist and Chemical Examiner, Calcutta—analyses biological materials like blood and prepares serum.

Central Food Laboratories

Central Food Research and Standardisation Laboratory, Ghaziabad.

Central Food Technological Research Institute, Mysore.

Central Food Laboratory, Calcutta.

It should be evident that health is not merely a matter of medicines, doctors and hospitals. The importance of nourishing food, proper clothing, housing, sanitation, etc. is obvious. And that makes the problem a challenge of unparalleled dimensions.

The government is, no doubt, doing its utmost to solve the problem. But the problem is far too big to be handled effectively by any single agency. It needs the active assistance and co-operation of every one concerned with the health of the nation, whether as individuals or as Institutions.

Malnutrition is a case in point. It is one of the major factors responsible for the high mortality and morbidity rates in India. The National Institute of Nutrition, Hyderabad, reports that 65 per cent of India's toddlers (age group 1 to 5) in the lower income levels, suffer from moderate malnutrition and 18 per cent from severe malnutrition. In March 1973, the Health Minister said in the Lok Sabha that about 60 million children of this group are badly undernourished. The reason is not protein starvation as some UN reports suggested but overall calorie starvation.

It is estimated that nearly one million toddlers die every year in India. Although this group (1 to 5 years) constitutes only 16.5 per cent of the population, it accounts for 40 per cent of the total deaths. Large numbers of children in this group, if they survive childhood starvation, are doomed to retarded physical and mental development..

India attempts to tackle the problem through Day-care centres where babies are fed nutritionally ideal food. The programme of providing noon meals to children at school is an extension of this programme to children over 5 years of age*. Such programmes can help but a few among millions. The problem, however, is not confined to India. All the developing countries, whether in Asia, Africa or South America, are blighted by this malady. The real problem here is not a problem of food, whether of quantity or of quality, but a problem of purchasing power. The simple fact is that the poor, the world over, have not enough money to buy the requisite food. This is neither a medical nor a health problem but an economic problem, pure and simple.

A report datelined Washington (Dec. 9, 1981) says "Confronting the problem of hunger and malnutrition among hundreds of millions in the Indian subcontinent, the Sahel and elsewhere, government workers, non-official observers, private charitable agencies and international experts have reached the unanimous conclusion that the problem is not one of availability of food in the world but purchasing power."

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* Also see 'Social Welfare' infra

The New York Times in a frontpage despatch notes that there is enough grain produced now to provide every man, woman and child on earth with some three thousand calories a day.

That is more than the average level of consumption in the US and about fifty per cent above what is now considered to be a minimum acceptable level of calorie consumption.

"On the other hand, chronic malnutrition persists often in countries where plenty of food is available such as in India and Brazil".

151 SOCIAL WELFARE

Family Welfare. The Government of India was the first government in the world to adopt family planning as an official programme and to include it in its Five-Year Plans. This programme is intended to reduce the birth rates and to stabilise the population at a level consistent with the requirements of national economy.

The scheme is gigantic. It has to cover at least 90 million couples in the reproductive age group. It is worked as a voluntary programme. Freedom is given to people to adopt any of the approved methods of contraception available, both for limiting families and spacing children.

It is being increasingly realised that family planning is more a developmental project than a simple scheme for cutting down birth rates. According to the Ministry of Health and Family Planning, high fertility rates have been indentified as more a function of poverty than of anything else. The Family Planning Programme which is expected to tackle the problem of high growth rates of population has therefore been linked with the basic problem of poverty so that it is not run in isolation from social realities. As a social welfare programme, family planning is taken as a component of development. Hence, it is linked with the Minimum Needs Programme which has the basic aim of improving the quality of life of a large section of our people who have long remained victims of poverty and under-development. In fact, Family Planning has been recognised as the 'inarticulate premise' which makes all the development efforts meaningful.

Methods of Family Planning. Four methods are adopted to ensure birth control, namely Intra-Uterine Contraceptive Device (IUCD), Sterilisation, Conventional Contraceptives and Pills. The intra-uterine device adopted in India is the *Lippe's Loop*. Sterilisation includes both vasectomy (sterilisation of males) and tubectomy (sterilisation of females). Conventional contraceptives include the condom, diaphragm, foam tablets and contraceptive jellies. *Nirodh* (a brand name) is at present the most popular condom in India. Oral pills intended to prevent pregnancy were introduced in 1967 and are now being used extensively.

In 1976 the Govt. of India laid special emphasis on family planning and issued a policy statement on population on April 16, 1976. The special emphasis apparently resulted in excesses like forced sterilisation in many parts of the country. This gave a rude setback to the family planning programme. In fact, the very idea of family planning fell into disrepute, so much so, that the Janata government which came into power in March 1977 changed the name 'family planning' into 'family welfare'.

The Govt. of India has taken various steps to boost up the family planning programme. Monetary incentives include cash compensation for loss of work or wages on account of participating in any family planning programme. Special incentives are: Rs 100 for vasectomy and Rs 120 for tubectomy. In cases of death resulting from sterilisation or IUD insertion or other complications, Rs 5000 will be paid to the surviving spouse and, if there is no surviving spouse, to the natural heir.

Abortions

The Medical Termination of Pregnancy Act 1971, and the Rules and Regulations made thereunder have been declared effective from 1st April 1972.

This measure was taken mainly to eradicate a large number of clandestine abortions which done by quacks caused considerable mortality and morbidity in pregnant women. The pregnancy can be terminated by qualified doctors in well equipped hospitals. Though this Act is mainly a health care measure, it can suplement family welfare planning as a large percentage of women undergoing medical termination of pregnancy readily accept family planning measures.

Since the inception of the MTP Act (April 1972), a total of 2.23 million terminations have been achieved up to December 1981.

Post-partum Programme is a maternity-centred hospital-based approach to family planning. This programme aims at persuading women during maternity to adopt family planning voluntarily. The doctors at the hospital provide the necessary medical and surgical help.

In 1978-79 a total of 1,060,931 obstetric (OB) and abortion (AB) cases were conducted in 338 post-partum centres in the country. Abortions and MTP (270,637) constituted 25 per cent of the total OB and AB cases during 1978-79 as against 24.7 per cent during 1977-78.

There were, as per the latest information available, 3319 institutions duly approved for conducting these terminations all over India.

Performance in Family Planning

The rising trend of performance which had picked up significantly in 1978-79 for all methods as compared to that during 1977-78 was maintained in 1979-80 as well, except in the case of conventional contraceptives and oral pills.

The year 1980-81 recorded a significant improvement in the performance of family planning programme. The total number of acceptors reached 6.4 million which was 17.5 percent higher than the number enrolled during 1979-80. The number of sterilisations crossed the two million mark and was higher by 14.0 percent as compared to the previous year. Conventional Contraceptive users showed an impressive increase of 23.8 percent. There was, however, a decline of 1.6 percent in the enrolment of IUD acceptors. The table below gives the performance in 1980-81 as compared to 1979-80 as well as in relation to the targets for the year 1980-81:—

Table 152

Family Planning *(Figures in million)*

Sl No	Method	Target 1980-81	Achievement		%Change in Performance in 1980-81 over 1979-80	%Achvt. of annual target 1980-81
			1980-81*	1979-80		
1	2	3	4	5	6	7
1.	Sterilisation	2.90	2.03	1.78	(+) 14.04	70.0
	(a) Vasectomy	—	0.44	0.47	(-) 6.38	—
	(b) Tubectomy	—	1.59	1.31	(+) 21.37	—
2.	I.U.D.	0.79	0.62	0.63	(-) 1.59	78.8
3	Other Methods (Eq. Users)	5.54	3.79	3.07	(+) 23.45	68.4
3.						
3.1	Conventional Contraceptive Users	5.04	3.70	2.99	(+) 23.75	73.4
	(i) Free Distribution	3.04	1.90	1.91	(-) 0.52	62.5
	(ii) Commercial Distribution	2.00	1.80	1.08	(+) 66.67	89.9
3.2	Oral Pill Users	0.50	0.09	0.08	(+) 12.50	17.9
	Total Acceptors		6.44	5.48	(+) 17.52	

Figures provisional

Couples Protected. About 26.4 million couples (22.7% of the total eligible couples in the reproductive age-group whose wives are in the age-group 15-44 years) have been effectively protected against conception by one or the other approved family planning methods as of March, 1981. Of these 20% have been protected by sterilisation alone. Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Orissa, Punjab, Tamil Nadu, West Bengal, Chandigarh, Delhi and Pondicherry have protected a higher percentage of couples than the all-India percentage (22.7%).

Age of Marriage

The Child Marriage Restraint Act, better known as the Sharada Act, was passed in 1929 to prevent child marriages. This Act fixed the minimum age for marriage as 14 for girls and 18 for boys. In 1949 the limit was raised in the case of girls to 15.

As an auxiliary to family planning and also as a measure of social welfare it was decided to raise the marriageable age still further. Accordingly in Aug. 1976, a bill was introduced in the Lok Sabha to raise the minimum age of marriage from 15 to 18 for girls and from 18 to 21 for boys.

The bill seeks to amend the Child Marriage Restraint Act and make consequential changes in the Hindu Marriage Act and the Indian Christian Marriage Act.

While offences under the Sharada Act were not cognizable, the present bill provides for taking cognizance of the offences and making them punishable with simple imprisonment which may extend to one month or with a fine up to Rs. 1000 or with both.

Women & Children

Children. More than two-fifths of the population in India comprises children. They represent the most important resource for national development. Since the majority of them belong to the vulnerable sections of society, social services have to be organised and brought within their reach so that they can realise their full potentialities for growth and development.

Integrated Child Development Services (ICDS) aim at providing a package of early childhood services consisting of supplementary nutrition, immunisation, health check-up, referral services, nutrition and health education, and non-formal education to children below six years of age, and expectant/nursing mothers so that every child in the project area could have a reasonable opportunity of survival and develop into a useful member of society. The Projects are being taken up in selected Blocks in the most disadvantaged backward rural/tribal areas and urban slums

Creches. The scheme, implemented by voluntary agencies, provides daycare services for children of the age group 0-5 years. Services include sleeping facilities, health care, supplementary nutrition, immunisation and entertainment for the children. Each unit consists of 25 children. For each unit, a maximum of Rs. 505 is prescribed for monthly recurring expenditure and a lump sum of Rs, 2500 for non-recurring expenditure.

The **Special Nutrition Programme (SNP)** was launched in 1970 as a crash programme to provide supplementary nutrition to children below 6 years, and expectant and nursing mothers living in the poverty-stricken areas of urban slums, tribal and backward rural areas. SNP aims at bridging the existing nutritional gap in the two target groups by providing supplementary feeding to the extent of 200 to 300 calories and 12-15 grams of protein per child, and 500 calories and 20-25 grams of protein per mother per day for 300 days in a year.

The SNP which made a modest beginning with a coverage of six lakh beneficiaries during 1970-71 reached a level of 38 lakhs through 28,000 feeding centres spread all over the country by the end of the Fourth Five-Year Plan. During the Fifth Plan, the coverage achieved under SNP was about 57.3 lakhs. The present coverage under the programme is about 70 lakh beneficiaries at 60,000 centres spread all over the country.

The *World Food Programme Project*, 2206, has been operating in India since the middle of 1976. Under this project, supplementary nutrition is provided to pre-school children below six years, pregnant women and nursing mothers from the vulnerable sections of society. The project is targeted to cover 20 lakh beneficiaries till 1982 in the states of Assam, Bihar, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan Uttar Pradesh and West Bengal.

CARE* provides food commodities for supplementary nutrition programmes for school and pre-school children. In 1979-80 CARE supplied 148 lakh tonnes of food commodities to school children and 138 lakh tonnes for pre-school children

Women's Hostels: In view of the paucity of safe accommodation at reasonable cost in urban areas and the consequent hardship faced by working women from low-income groups, the Government of India started in 1972 a central scheme of assistance to voluntary organisations engaged in the field of women's welfare for the construction/expansion of hostel buildings for working women having an income not exceeding Rs. 1000 per month.

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* Co-operative for American Relief Everywhere (See Abbreviations)

Since the inception of the scheme in 1972-73 till 1980, 205 hostels had been built, accommodating 1377 working women.

Maternal and Child Health Programme. The table below shows the achievements in 1980-81 and 1979-80 under the Maternal and Child Health Programme.

Table 153

Maternal and Child Health

(Figures in 000's)

Activity	Target for 1980-81	Achievements*		Percentage Increase (+) Decrease (—) of performance in 1980-81 as compared to 1979-80	Percentage or achievement of target
		1980-81 (April, 80 to March 1981)	1979-80 (Corresponding period)		
1	2	3	4	5	6
(a) *Immunisation*					
(i) Tetanus Immunisation					
(i) Tetanus Immunisation for expectant mothers.	6.839	5.188	4.746	(+) 9.3	76.0
(ii) DPT Immunisation for Children	13.550	7.044	6.829	(+) 3.1	52.1
(iii) DT Immunisation for Children	11.370	10.062	10.731	(-) 6.2	88.7
(b) *Prophylaxis against nutritional anaemia among*					
(i) Total Women (includes expectant and nursing mothers including family planning acceptors)	11.910	10.884	11.484	(-) 5.2	99.2
(ii) Children	11.910	9.461	9.950	(-) 4.9	86.5
(c) *Prophylaxis against blindness due to Vit 'A' deficiency Ist dose*	24.200	16.307	16.963	(-)3.9	67.4

* Figures provisional

Immoral Traffic in Women

Immoral traffic in women and girls is a punishable offence under the Indian Penal Code. The Penal Code is supported by a special Act, the Suppression of Immoral Traffic in Women and Girls Act 1956, which provides for the suppression of immoral traffic in terms of the International Convention signed at New York in May 1950.

Drug Addiction

Opium has been banned in India for a long time, except for medical purposes. Ganja (cannabis) in any form is totally banned. Nevertheless, drug addiction is wide-spread. According to the United Nations Drug Commission there are 80,000 people in India taking opium and 200,000 taking ganja.

Beggary

Beggary within railway premises was prohibited by law in 1941. Special Acts have been passed by most of the States to prohibit begging in public places. In others, Municipal and Police Acts provide measures against begging.

To deal effectively with persons who kidnap children for the purpose of exploiting them for begging, the Indian

Penal Code (Amendment) Act, 1959 was enacted. This Act makes kidnapping or obtaining custody of a minor and maiming of a minor for the purpose of begging, specific offences and provides for deterrent punishment which may extend to life imprisonment where children are maimed.

152. BACKWARD CLASSES

The term "Backward classes" includes the Scheduled Castes and Tribes, denotified Nomadic and Semi-nomadic tribes and other backward classes.

Harijans. Indian society through the centuries had evolved on the basis of caste. This evolution stratified the people into a social hierarchy. Those at the lowest rungs were a down-trodden lot, spurned alike by all other castes. Long before independence, these people, known as the depressed classes, attracted the attention of all social reformers. Gandhiji christened them Harijans and fought all his life to improve their lot and raise their status. With independence, these Harijans came into their own. The Constitution of India not only conferred on them equal rights with others but also gave them a number of concessions and preference. These people are known as Scheduled Castes in the Constitution.

Gijijans. Another group of depressed classes is represented by the tribals inhabiting the hilly tracts. These tribes, scattered throughout India, belong to different ethnic groups and have widely varying cultures. They are completely cut off from the main stream of national life and eke out their existence in the hills and forests. These people are now conveniently dubbed together as Girijans or hill people. These are the Scheduled Tribes under the Constitution.

The Scheduled Castes and Scheduled Tribes have to be notified as such by the President under Arts. 341 and 342 respectively, so as to enable them to enjoy the preferential rights conferred on them by the Constitution.

Nomadics & Others. These are recognised and listed by the State governments and Union Territories, where they are found. As these lists are often revised by States to include new communities or exclude old ones, no firm figures are available, either about the number of communities listed or the total number of persons who belong to these categories.

The Commissioner for Scheduled Castes and Tribes is a statutory authority appointed under Article 338 of the Constitution. He is to investigate into the various safeguards provided for these Castes and Tribes in the Constitution and to report to the President on the working of these safeguards.

Backward Classes. The welfare programmes in the Plan for the Backward Classes mainly fall into two categories, namely, Central and Centrally Sponsored Programmes and the State Sector Programmes or Centrally Aided Programmes. In the category of "Central or Centrally Sponsored Programmes" such schemes are included which need to be given high nation-wide priority and intensive coverage over a length of time and for which the Government of India gives cent per cent grant-in-aid. The State Sector schemes are formulated according to the local needs. The State Sector schemes are also aided by the Central Government according to the principle decided by the NDC (National Development Council).

Scheduled Castes & Tribes. The Constitution prescribes protection and safeguards for the scheduled castes and tribes and other backward classes either specially or by way of insisting on their general rights as citizens with the object of promoting their educational and economic interests and of removing the social disabilities which the scheduled castes were subjected to.

The main safeguards are:

i the abolition of 'untouchability' and the forbidding of its practice in any form (art. 17);

ii the promotion of their educational and economic interests and their protection from social injustice and all forms of exploitation (art. 46);

iii the throwing open by law of Hindu religious institutions of a public character to all classes and sections of Hindus (art. 25);

iv the removal of any disability, liability, restriction or condition with regard to access to shops, public restaurants, hotels and places of public entertainment or the use of wells, tanks, bathing ghats, roads and places of public resort maintained wholly or partly out of State funds or dedicated to the use of the general public (art. 15);

- v the curtailment by law, in the interests of any scheduled tribe, of the general rights of all citizens to move freely, settle in and acquire property [art. 19 (5)];
- vi the forbidding of any denial of admission to educational institutions maintained by the State or receiving aid out of State funds (art. 29);
- vii permitting the State to make reservation for the backward classes in public services in case of inadequate representation and requiring the State to consider the claims of the scheduled castes and tribes in the making of appointments to public services (arts. 16 and 335);
- viii special representation in the Lok Sabha and the State Vidhan Sabha to scheduled castes and tribes till 25 January 1980 (arts. 330, 332 and 334);
- ix the setting up of Tribes Advisory Councils and separate departments in the states and the appointment of a special officer at the centre to promote their welfare and safeguard their interests (arts. 164 and 338 and Fifth Schedule);
- x special provision for scheduled and tribal areas (art. 244 and Fifth and Sixth Schedules); and
- xi prohibition of traffic in human beings and forced labour.

The Protection of Civil Rights Act, 1976. The Constitutional safeguards provided for the low castes have been put into working operation by The Untouchability Offences Act. This Act was amended in 1976 and re-named The Protection of Civil Rights Act, 1976.

The Protection of Civil Rights Act providing for enhanced and stringent punishment for offence relating to untouchability came into force from November 19, 1970.

Table 154

Population: Scheduled Castes & Tribes, 1971

	Scheduled castes	*Scheduled tribes*
India	79995896	38015162
States		
Andhra Pradesh	5774548	1657657
Assam	912557	1606648
Bihar	7950652	4932767
Gujarat	1825432	3734422
Haryana	1895933	—
Himachal Pradesh	769572	141640
Jammu & Kashmir	381277	—
Karnataka	3850034	231268
Kerala	1772168	269356
Madhya Pradesh	5453690	8387403
Maharashtra	3025761	2954249
Manipur	16376	334466
Meghalaya	3887	814230
Nagaland	—	457602
Orissa	3310854	5071937
Punjab	3348217	—
Rajasthan	4075580	3125506
Tamil Nadu	7315595	311515
Tripura	192860	450544
Uttar Pradesh	18548916	198565
West Bengal	8816028	2532969
Union Territories		
Andaman & Nicobar Islands	—	18102
Arunachal Pradesh	339	369408
Chandigarh	29073	—
Dadra & Nagar Haveli	1332	64445
Delhi	635698	—
Goa, Daman & Diu	16514	7654
Lakshadweep	—	29540
Mizoram	82	313229
Pondicherry	72921	—

According to an official release, preaching of untouchability or its justification on any ground is an offence, under the Act. Besides, compulsion in relation to practice of untouchability is also liable for punishment, ranging from a months's imprisonment to a maximum of two years' imprisonment and fines ranging between Rs. 100 and Rs. 1000.

Untouchability offences are cognizable*. They are also non-compoundable. In cases where punishment does not exceed three months, offenders will be tried summarily.

The act empowers the States to impose collective fines on the inhabitants of any area found guilty of untouchability offences.

Persons convicted for the offences will be disqualified from contesting election to Parliament and State Legislatures.

Public servants found wilfully neglecting investigation of untouchability offences will also be liable for punishment as abettors. Practice of untouchability in any form is punishable even in privately-owned places of worship, where the public have access.

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* The police can take action on it, without receiving any complaint.

153. WILD LIFE

India has long been famous for its spectacular wild life. It is on record that lions were hunted in the forests around Delhi, during the Moghul days. The advent of the British marked the beginnings of travail for Indian wild life. The British Sahibs were crazy about *shikar* (hunting). The Indian Princes showed themselves eager collaborators and an organised destruction of wild life went on in every part of India. The Indian poachers added their own quota of destruction to the depredations of the high and the mighty. Indian herdsmen penetrated more and more into the forests to graze their cattle and frightened off many wild animals from their settled habitats. Clearing of forest areas for cultivation had the same result. The cumulative effects have been a great reduction in the numbers of all species of wild life, in the extinction of many species and the imminent destruction of many more.

Extinct & Vanishing Species

Wild Life in the world over is on the decline. About 120 species of mammals and some 225 species of birds have disappeared since 1600. It is estimated that today some 650 species of mammals and birds face extinction all over the world. These include the Imperial Eagle of Spain, the Grizzly Bear of Mexico, the Kit Fox of North America, the Polar Bear of the Arctics, the Oryx of Arabia, the Mountain Gorilla of Africa and the Snow Leopard of the Himalayas. Everywhere man has been the main agent of destruction.

India has had its share of extinct species. The two-horned rhinoceros of Sunderbans has disappeared. The Indian cheetah or hunting leopard once so common is gone for ever. Many species are on the verge of extinction. The swamp deer and the nilgai have made their last stand on the periphery of the forests. Their further retreat is blocked by a hostile habitat. The black buck, the chinkara, the Indian wolf and the striped hyena exist only in precarious survival pockets. The wild ass of the Rann of Kutch, the snow leopard and clouded leopard of north east India, the Kashmir stag, musk deer, wild buffalo and the pigmy hog are doomed unless prompt conservation measures are taken. Among birds, the great Indian bustard, the golden eagle, pink-headed duck, and white-winged wood-duck are becoming rarer and need protection. The tiger, once the terror of all India, is now a fugitive in its own home.

Wild Life Variety. Among the surviving species of wild life are the magnificent Himalayan fauna—the great Tibetan sheep, the blue sheep, the urial, the markhor, the ibex, the takin, the Tibetan gazelle, the Tibetan antelope (from whose underfur is made the fine 'cashmere' wools), the thick-furred snow-leopard, the rare clouded leopard, the red bear and the great Himalayan black bear.

The only Indian ape, the hoolock gibbon is found in Assam. Langurs and macaques of different varieties flourish throughout India—the capped langur of Assam, the black langur of Nilgiris, the lion-tailed macaque and the bonnet monkey of the Deccan.

Gaur, the white-stockinged Indian ox, chinkara, the Indian gazelle, the ungainly nilgai (blue bull), the four-horned antelope, the majestic sambar, the Kashmir stag, the swamp deer, spotted deer, barking deer, hog deer and musk deer‡ of the Himalayas and the dinky little mouse deer are other species of fascinating fauna.

The sloth bear and the spotted leopard are common sights in forests. The elephant, of course, is everywhere.

Protection Measures. Wild Life (Protection) Act 1972 has legalised the protection measures that are being taken to preserve the vanishing species.

The Asiatic lion is one of the rarest and most important wild animals of India. It is stockier in build and has bigger elbows, tufts and tail tassels, than the African species. The species roamed all over India, as late as the days of the Moghuls. But now less than 200 animals are left in the gir forests of Gujarat. The Gir forests are now protected. The protection afforded to the lion population in Gir is, as things go, quite unsatisfactory. The Gir forest is surrounded by cattle graziers, many of them with hundreds of cattle. These graziers poison lions, who foray into their pasture grounds inside the forest. Several lions have been killed in this manner. Steps are now being taken to check the inroads of graziers.

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‡ The musk deer is prized for its walnut-sized gland beneath the abdomen which contains natural musk. The male of the species which carries this gland is peculiar for its drooping canine teeth which hang down on either side of the jaws. A musk gland costs around 100 US dollars

A second home for the Gir lions has been provided at *Chandraprabha Sanctuary* in U.P. A lion and two lionesses brought from Gir in 1957 have increased to 12 in April, 1972 at Chandraprabha.

The one-horned rhinoceros, another vanishing species, is now protected in the Assam Sanctuaries of *Manas* and *Kaziranga*. Kaziranga with its grass plains dotted with waterlogged swamps suits the rhinoceros eminently. Other herbivora, like deer, wild buffaloes and pigs also thrive in these sanctuaries. But poachers do a lot of mischief in Manas and Kaziranga, in spite of protective measures. The mistaken belief that the horn of the rhinoceros is an excellent aphrodisiac, drives the poachers into the recesses of the sanctuary.

In 1972* a census of the rhinoceros showed a total of 658 as against 400 in 1966. This is more than half the world's total population of this species.

Tiger

In November 1972 the Indian Wild Life Board chose the tiger as the national animal of India. A national scheme called the "Project Tiger" was launched to protect the tiger population. The species has been dangerously depleted. The first tiger census taken in April 1972 revealed that there were only 1823 tigers in India as against an estimated 40,000 in the last century.

The tiger population was distributed as under:

Arunachal P.	69	Assam	147
Nagaland	80	Meghalaya	32
Tripura	7	W. Bengal	73
Bihar	85	Orissa	142
UP	262	Rajasthan	160
AP	35	Karnataka	102
T. Nadu	30	Kerala	60

The tiger project would ensure complete protection to the tiger species in seven specially selected reserves for scientific, economic, aesthetic, cultural and ecological purposes. The reserves are at *Manas* (Assam), *Palamau* (Bihar), *Simlipal* (Orissa), the *Corbett National Park* (UP), *Melghat* (Maharashtra), *Bandipur* (Karnataka) and *Sundarbans* (W. Bengal).

There will be no commercial exploitation of the habitat in these reserves for six years and anti-poaching operations will be strengthened.

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* The horn of a rhino sells at Rs. 35,000 pound in the black market. The official rate is Rs. 1200 only. No wonder the poachers never let go. The areas of greatest demand for rhino horns are China, South East Asia and Africa

NATIONAL PARKS & SANCTUARIES

There are at present 20 National Parks (NP) and 190 Wild Life Sanctuaries (S) in India. Details of important Parks and Sanctuaries are given below

Table 155

National Parks and Sanctuaries

Note The names of the more important national parks and specialised sanctuaries are given in full Others are indicated by their distinguishing names District or districts where they are located are given along with the names

Andhra Pradesh

Name & District	*Areas sq. km*	*Species found*	*Good visiting time*
Pakhal, Warangal	860	Tiger, panther, sambar, chital, nilgai etc.	Dec.-Mar.
Tadwai, Warangal	803	Tiger, Panther, gaur, jungle cat, sambar, black buck	-do-
Pocharam, Medak	129.5	Panther, chital, chinkara, peafowl and water bird	-do-
Kawal, Adilabad	616	Tiger, panther, gaur, sambar, chital, black buck, wild bear, sloth bear	-do-
Kolleru Pelicanary, Elleru	673	Pelicans, flamingo heron painted storks, avocet, teals and terns	-do-
Melapattu Bird Sanctuary Nellore	16	Gray palican heron, cormorants teals, duck etc	Nov.-Mar.

Kinnersani, Khamman	635.40	Tiger, panther, wolf, chital, sambar, nilgai, sloth bear, gaur	Dec.-Mar.
Papikonda, E. Godavari W. Godavari, Khamman	591.00	Tiger, panther, wild dog, hyena, jackals, wolves, gaur, four-horned antelope, chital, sambar and nilgai	Nov.-Jun.
Coringa, E. Godavari	235.00	Estuarine crocodile, otter, fishing cat, jackal, sea-gull, pelican, stork, heron, flamingo	Oct.-May
Nagarjunasagar, Srisailam, Guntur, Prakasam, Kurnool, Mahabubnagar, and Nalgonda	3568.00	Tiger, panther, sloth bear, wild boar, chital, sambar, nilgai, black buck, jackal, foxes, wolves and mugger crocodile	Oct.-Jun.
Pulicat, Nellore	500.00	Flamingos, pelicans, ducks, teals, stork, crane, heron	Oct.-Mar.

Arunachal Pradesh

Namdafa, Tirap	1807.82	Tiger, panther, snow leopard, clouded leopard, golden cat, binturang, wild dog, wild buffalo, gaur, Iranian bison, sambar, hog deer, barking deer, elephant, sloth bear, python, king cobra, Indian cobra, monitor, lizard and birds of many kinds	Nov.-Mar.
Pakkui Kameng	861.95	Elephant, gaur, Indian sambar, hog deer, barking deer, python	Nov.-Apr.

Assam

Garampani, Diphu	430.00	Elephant, wild buffalo, leopard, common langur, hoolock	Feb.-May
Kaziranga National Park, Jorhat	430	Great Indian one-horned rhinoceros, wild buffalo, elephant, gaur, leopard cat, wild boar, civet cat, otter, swamp deer, hog deer, sambar, tiger, python, pelican, partridge, floricans	-do-
Lakhawa, Nawgang	70	Rhinoceros, wild buffalo, swamp deer, hog deer, water ducks, cormorants	January
Manas, Barpeta (Tiger Sanctuary)	80	Elephant, tiger, panther, gaur, wild buffalo, great Indian one-horned rhinoceros, golden langur, civet cat, otter, swamp deer, hog deer, sambar, pigmy hog, water monitor, wild boar, great pied hornbill, florican	February
Sonai-Rupa, Tezpur	195	The great Indian one-horned rhinoceros, elephant, wild buffalo, sloth bear, wild dog, wild boar, sambar, barking deer, swamp deer, leopard, tiger, hornbill, imperial pigeon etc	Jan.-Apr.

Bihar

Hazaribagh, Hazaribagh	186.25	Tiger, leopard, sambar, chital, nilgai, wild boar, wild cat, pea-fowl etc	Oct.-Jun
Bhimbandh, Monghyr	681.90	Tiger, leopard, sambar, chital, wild boar, wolf, water birds	-do-
Mahudaur, Daltongung	63.25	Tiger, leopard, wolf, chital, barking deer, wild boar etc	Nov.-Jun
Dalma, Singhbhum	193.22	Elephant, leopard, wild boar, mouse-deer, barking deer, sloth bear	Oct.-Jun
Palamau, Daltongung (Tiger Sanctuary)	979.27	Elephant, panther, leopard, wild boar, barking deer, gaur, chital, sambar, pea-fowl etc	whole year

Gautam Budha, Gaya	259.50	Tiger, leopard, sambar, chital, barking deer, pea-fowl etc.	Oct.-Jun.
Kaimur, Rohtas	1342.22	Tiger, leopard chinkara, sambar, nilgai and crocodiles.	Oct.-Jun.
Bamiaburu, Singhbhum	129.50	Tiger, panther, sambar, elephant, wild boar etc.	Oct.-Jun.
Kodaram, Hazaribagh	176.12	Tiger, leopard, sloth bear, sambar, chital, four-horned antelope.	Oct.-Jun.
		Goa, Daman and Diu	
Mollem, Goa	240	Gaur, sambar, mouse deer, barking deer, panther, flying squirrel, porcupine, civet cats, ant-eaters, slender loris, grey jungle fowl.	Nov.-May
		Gujarat	
Gir National Park Junagarh	140.40	Asiatic lion, panther, striped kyeena, sambar, nilgai, chital, four-horned antelope, chinkara, wild boar, crocodiles	Dec.-Jun.
Valavadar National Park Bhavnagar	17.83	Black-buck, wolf	Oct-Jun.
Gir, Junagarh	1412.13	Asiatic lion, panther, striped hyena, sambar, nilgai, chital, four-horned antelope, chinkara, wild boar, crocodiles.	Dec.-Jun.
Nal Sarovar Bird Sanctuary, Ahmedabad	115.00	Water birds	Nov.-Feb.
Wild Ass Sanctuary Little Rann of Kutch Surendranagar	4840.89	Wild ass, nilgai, wolf, chinkara.	Jan.-Jun.
Purna, Dangs	299.43	Tiger, panther, leopard cat, jungle cat, jackal, fox, four-horned antelope, wild pig, chital, sambar, bonnet macaque.	Jan.-Jun.
		Haryana	
Sultanpur Lake Birds Sanctuary, Gurgaon	1.2	Sarus crane, spot-bills, ruddy shel drakes etc.	Oct.-Mar.
		Jammu and Kashmir	
Dachigam, Srinagar	55 Sq. miles	Leopard, black bear, brown bear, baboons, serow, musk deer, hangul	Apr.-Nov.
Raj Parian, Anantnag	20.50 Sq. miles	Brown bear, black bear, musk deer, serow, hangul.	-do-
		Himachal Pradesh	
Rohia National Park Kulu	197.8	Ibex, musk deer, tahr, serow, lynx, Himalayan brown bear, snow leopard, tragopan, snow pigeon, snow cock etc	Apr.-Jun. Sept.-Oct.
Tundah, Chamba	64.2	Tahr, brown bear, black bear, musk deer, goral, serow, ibex, monal, tragopan, snow cock, kalij, chakor and chir, snow leopard, panther, weasel, martens, civets, fox, flying fox.	Apr.-Jun. Sept.-Oct. -do-
Kugti, Chamba	118.3	Tahr, brown bear, black bear, musk deer, goral, serow, ibex, monal, tragopan, snow cock, kalij, chakor and chir, snow leopard, panther, weasel, martins, civets, fox flying fox.	-do-

Nargu & Winch, Mandi	278.4	Goral, black bear, serow, musk deer, monal, kalij, koklas and chir, panther, snow leopard, martens, civet, fox, flying fox.	Apr.-Jun. Dec-Jan
Shikari Devi, Mandi	213.5	Black bear, goral, barking deer, serow, musk deer, monal, kalij, chir, chakor, partridge, panther, snow leopard, martens, civet, fox, flying fox.	Apr.-Jun. Dec.-Jan.
Gobind sagar, Lilaspur	100.4	Duck, teal, goose, crane	Whole year
Shri Naina, Lilaspur	163.4	Sambar, barking deer, black bear, wild boar, nilgai, kalij, red jungle fowl, partridges, panther, snow leopard, martens, civet, fox, flying fox.	-do-
Derang Kinnaur	167.4	Goral, Black bear, serow, monal, kalij, koklash, chakor, panther, civets, martens, flying foxes.	Apr.-Jun. Sept.-Oct.
Talra, Simla	76.2	Goral, black bear, sambar, musk deer, kalij, koklash, chakor, monal, panther, flying fox, civet, martens.	-do-
Raksham and Chitkul, Kinnaur	138.3	Bharal, goral, black bear, brown bear, monal, koklash, snow cock, chakor, panther, fox, martens, flying fox.	-do-
Lipa Asrang, Kinnaur	109.1	Ibex, bharal, goral, monal, koklash, snow cocks, chakor, panther, fox, martens, flying fox.	-do-
Simbalbara, Sirmur	55.4	Sambar, goral, barking deer, wild boar, kalij, pea-fowl, red jungle fowl, partridge, panther, fox, martens, civet, flying fox, chital and monal.	Whole year
Kanswar, Kulu	54.3	Tahr, serow, goral, black bear, kalij, koklash, chakor, patridges, chir, panther, civets, martens, flying fox.	Apr.-Jun Sept.-Oct.
		Karnataka	
Bandipur National Park, Mysore (Tiger Sanctuary)	874.20	Indian elephant, tiger, gaur, sambar, chital, barking deer, wild dog, wild boar, jackal, sloth bear, panther, four-horned antelopes, malabar squirrel, jungle fowl, partridge, green pigeon, bush quail, etc.	Mar.-Aug.
Bannarghatta National Park, Bangalore	104.20	Elephants, sloth bear, chital, barking deer, gray partridges, bush quail, jungle fowl, etc.	Whole year
Nagerhole National Park, Coorg	571.55	Elephant, tiger, panther, chital, sambar, sloth bear, jungle fowl, partridge etc.	Oct.-Mar.
Someshwara, South Kanara	844.8	Chital, gaur, sambar, panther, tiger, sloth bear, wild dog etc.	-do-
Brahmagiri, Coorg	181.29	Tiger, panther, sambar, chital, barking deer, sloth bear, cobra, flying squrrel, malabar squirrel, civet cat, mouse deer.	-do-
Malkote, Mandya	49.82	Panther, wolves, sloth bear, black-bucks, hare, porcupines, wild boar.	-do-

Ghataprabha Bird Sanctuary, Belgaum	29.785	Egret, cormorant, heron etc.	
Tungabhadra, Bellary	224.22	Black-buck, chinkara, panther, chital, pig, four-horned antelope and fox, sand grouse, florican, great Indian Bustard, sloth bear, sambar etc.	
Ransbennur Black Buck Sanctuary, Dharwar	119.00	Black buck, chital, wolf, hare, great Indian bustard.	Whole year
Mukambika, South Kanara	247.00	Panther, sambar, elephant, wild boar, porcupine.	
Sharawathy Valley, Shimoga	348.00	Indian elephant, tiger, panther, gaur, sambar, chital, barking deer, wild boar, sloth bear, four-horned antelope, partridges, green pigeon, bush quail, lion-tailed monkey, tortoise, crocodile, python, cobra, krait, viper, green snake etc.	Feb.-May
Biligiri Rangaswamy, Mysore	324.4	Elephant, gaur, chital, barking deer, sambar, panther, sloth bear.	-do-
Bhadra, Chikmagalur	492.00	Gaur, elephant, panther, wild bear, sambar, chital, barking deer, sloth bear.	Jan.-Jun.
Shettimalli, Shimoga	395.60	-do-	Feb.-May
Ranganthittoo Bird Sanctuary, Mysore	26.70	Open bill stork, white ibis, little egret, cattle, egret, darter, cormorant, pond heron, river tern, spoon bill, crocodile etc.	July-Aug.
Dandeli, Dharwar	874.20	Tiger, panther, elephant, gaur, sloth bear, sambar, chital, wild bear etc.	Feb.-May
		Kerala	
Eravikulam Rajmallay National Park, Idduki	97	Elephant, gaur, sambar, barking deer, tiger, panther, civet, jungle cat, nilgai, langur, wild boar, lion-tailed macaque, malabar squirrel, wild dogs, nilgiri tiger, imperial pigeon, grey jungle fowl.	Oct.-Apr.
Periyar, Idduki	777	Elephants, tiger, panther, wild dog, gaur, sloth bear, nilgai, wild boar, sambar and barking deer.	-do-
Parambikulam, Palghat	285	Elephant, gaur, leopard, tiger, sloth bear, nilgai, chital, sambar, wild boar, crocodiles.	-do-
Wynad, Cannanore and Kozhikode	844	Elephant, gaur, sambar, wild boar, chital, barking deer etc.	-do-
		Madhya Pradesh	
Kanha National Park Mandla & Balaghat	940	Tiger, panther, gaur, barasingha, chital, sambar, black buck, chowsingha, barking deer, mouse deer, nilgai, wild dog, boar.	Mar.-Jun.
Bandhavgarh National Park, Shahdol	105	Tiger, panther, gaur, chital, sambar, nilgai, chinkara, barking deer, bear, wild boar and a variety of upland birds.	Nov.-Jun.
Shivpuri National Park Shivpuri	156	Tiger, panther, sloth bear, hyena, sambar, spotted deer, four-horned antelope, black buck, nilgai, chinkara, wild boar, crocodiles etc.	Jan.-Jun.
Bori, Hoshangbad	802.89	Tiger, panther, bison, sambar, chital, nilgai, barking deer, chinkara, wild boar, bear.	-do-

Kutree Wild Buffaloes Game Sanctuary, Bastar	2273.58	Wild buffalo, tiger, panther sloth bear, nilgai, chital, sambar, wild pigs, barking deer, bison, wild dogs, chowsingha etc.	Mar.-Apr.
Tamor-pigle, Sorguja	608.52	Tiger, panther, gaur, chital, sambar etc.	Dec.-Mar.
Samarsot, do	430.361	do	-do-
Sitanadi, Raipur	1500	Tiger, panther, sambar, chital, bison, wild boar, barking deer, peacock etc.	Mar.-Jun.
Nordehi, Sagar, Damoh & Narsinghgarh	1500	Tiger, panther sambar, chinkara, chital, nilgai, bear etc.	Dec.-Mar.
Bagdara, Sidhi	478.900	Panther, black buck, chinkara, sambar, nilgai, wild pig etc.	Nov.-Jun.
Pachmarhi, Hosangabad	654.49	Tiger, panther, bear, bison, spotted deer, sambar, barking deer, nilgai etc.	Mar.-Jun.
Achanakmar, Bilaspur	551.52	Tiger, bison, sambar, chital, boar, peacock etc.	Nov.-Jun.
Ratapani, Raisen	530.36	Tiger, panther, sambar, chital, blue bull, chinkara etc.	Feb.-Jun.
Panch, Chindwara & Saoni	449.39	Tiger, panther, gaur, chital, sambar, nilgai etc.	Nov.-Jun.
Gandi Sagar, Mandsaur	224.65	Water birds, chital, sambar, chinkara, barking deer.	-do-
		Maharashtra	
Todoba National Park Chandrapur	116.55	Tiger, panther, sloth bear, gaur, sambar, chital, nilgai, chinkara and crocodiles.	May & Jun.
Pench National Park Nagpur	257.26	Tiger, panther, gaur, sloth bear, sambar, chital, barking deer, four-horned antelope, nilgai, chinkara, jungle fowl and pea-fowl.	May
Nawegaon National Park Bhandara	133.884	Tiger, panther, sloth bear, gaur, sambar, chital, barking deer, nilgai and migratory birds.	May
Borivli National Park, Bombay Suburban	67.977	Panther, sambar, four-horned antelope, mouse deer, wild boar and langurs.	Jan.-Mar.
Melghat, Amraya (Tiger Sanctuary)	381 58	Tiger, panther, gaur, sloth bear, sambar, barking deer, four-horned antelope, wild boar, chital. Bird life is plentiful	Apr & May
Yawal, Jalgaon	177.52	Panther, jungle cat, nilgai, bonnet macaque and common langur, wild dog, sambar, hyena, tiger, chital and chinkara, pea-fowl, green pigeon, sand grouse and partridge, grey jungle fowl.	-do-
Radhanagari (Bison) Kolhapur	2072	Gaur, panther, sambar and wild boar. Bird life is fairly lavish.	May-Sept.
Barnala (Bird), Kolba	4 48	Ashy minivet, paradise flycatchers, shama, malabar whistling thrush, racket-tailed drongo, wood-pecker etc. Other wildlife seen are the panther, four-horned antelope & common langur	Jan.-Apr
Tansa, Thane	216 75	Panther, four-horned antelope, chital, sambar and wild boar. Bird population is diverse and colourful around the Tansa lake	May

		Manipur	
Reibul Lamjao National Park, Central	25	Brow antlered deer, wild goat and water birds	
		Meghalaya	
Balpakram* Garo Hills	85	Elephants, gaur, chital, sambar, wild boar.	Winter
		Mizoram	
Dampa, Aizawl	180.00	Elephant, tiger, leopard, sambar, barking deer, Himalayan bear, wild boar, wild-dogs, wild-cat, gaur, leopard cat, king cobra, python, hornbill pheasant etc.	Nov.-Feb.
		Nagaland	
Intangki, Kohima	202.00	Gaur, boar, elephant, barking deer, wild boar, clouded-leopard, panther, tiger, pangolin and various kinds of birds and reptiles.	Nov.-Mar.
		Orissa	
Satkosia Gorge, Dhenkanal, Puri, Cuttack & Phulbani	750	Gharial and muggar, tiger, leopard, jungle cat, civet, gaur, ratel, sloth bear, sambar, chital, nilgai, four-horned antelope, elephants, hornbill, pea-fowl, jungle-fowl and other birds.	Summer and Winter
Bhittar Kanika, Cuttack	170	Salt-water crocodile, leopard, hyena, jungle cat, leopard cat, wild boar, chital, sambar, giant squirrel, water monitor, sea-turtle, king cobra, python, painted stork, adjutant storks, open-billed stork, white ibis, black ibis etc.	Winter
Chilka, Ganjam & Puri	900	Black buck, chital, sea cow, cranes, ibis, cormorant, egret, flamingo and pelican.	Winter
Karlapat; Kalahandi	145	Tiger, leopard, gaur, chital, sambat etc.	Winter
Ushakothi, Sambalpur	192	Elephant, gaur, tiger, leopard, sambar, chital and barking deer.	Winter
Similipal, Mayurbhanj (Tiger Sanctuary)	303	Tiger, elephant, gaur, chital, leopard, mouse deer, flying squirrel and mugger.	Winter
		Punjab	
Abohar, Ferozepur	228	Black buck, hare, partridge, grey & black pigeon & doves.	1st Oct.-1st Mar.
		Rajasthan	
Ranthambor Sawai-Madhopur (Tiger Sanctuary)	392.20	Tiger, panther, hyena, jungle cat, civet, sambar, chital, nilgai, bear wild boar, partridge, green pigeon, red spur fowl etc.	All year except Jul.-Aug. and Sept.
Sariska, Alwar	195	Tiger, panther, hyena, jungle cat, civets, sambar, chinkara, nilgai, four-horned antelope, partridge, green-pigeon, red spur fowl.	All year except Jul, Aug. and Sept.
Ghana Bird Sanctuary Bharatpur	29	Siberian crane, cormorants, storks, spoon bill, quails coot, heron, teal, terns etc. and sambar, chital, black buck, wild boar, civet etc.	1st Oct. -end of Feb.

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* Proposed sanctuary.

Darrah, Kota	201	Tiger, panther, sambar, chital, nilgai, wild boar, hare, partridge, grouse.	All year except Jul.-Sept.
Mount Abu, Sirohi	112.60	Sambar, nilgai, hare, jungle-fowl, partridges etc.	All year except Jul.-Sept
Kumbhalgarh-Ranakpur Udaipur, Jodhpur Dists.	500	Wild bear, sambar, panther, nilgai, wild boar, jungle fowl, red spur fowl.	All year except Jul.-Sept.
		Sikkim	
Khangchandzenda National park, Gangtok	850	Snow leopard, clouded leopard, marbled cat, civet, binturone, Himalayan black bear, red panda, Tibetan wild ass, blue sheep, serow, takin, musk deer, pheasant, partridge, green pigeon etc.	
		Tamil Nadu	
Guindy National Park, Madras	2.8	Chital, black buck & a snake park.	Whole year
Mudumalai, The Nilgiris	321	Elephant, gaur, chital, sambar, tiger, panther, sloth bear, wild dogs etc.	Feb.-Jun.
Amarmalai, Coimbatore—	958	-do-	-do-
Tirunelveli Tiger Sanctuary -	520	Tiger, chital, sambar, wild boar, lion-tailed macaque	Sept.-Nov.
Kalakad, Tirunelveli	223.58	Lion-tailed macaque	Whole year
		Uttar Pradesh	
Corbett National Park, Nainital, Garhwal (Tiger Sanctuary)	525	Elephant, tiger, panther, sloth bear, nilgai, sambar, chital, wild boar, porcupine, peafowl, red Indian jungle fowl, partridge and both the species of Indian inland crocodiles, goral & four-horned antelope.	Nov.-May
Dudwa National Park, Lakhimpur, Kheri	500	Tiger, panther, sloth bear, sambar, swamp deer, chital, hog deer, barking deer, nilgai, peafowl, and jungle fowl, partridge etc.	-do-
Govind Pashu Vihar, Uttar Kashi	953	Brown and black Himalayan bear, snow leopard, bharal, musk deer, tahr, serow, goral, panther, sambar, wild boar, monal, pheasant, snow pigeon, green pigeon.	Sept.-Oct. May-Jun.
Nanda Devi, Chamoli	324	-do-	-do-
Rajaji, Sharanpur	247	Elephant, tiger, panther, sloth beer, nilgai, sambar, chital, kakar, wild bear, porcupine, pea-fowl, red Indian jungle fowl and partridges etc.	Nov.-May
Kishanpur, Lakhimpur Kheri	227.12	Brown and black Himalayan bear, snow leopard, bharal, musk deer, tahr, serow, goral, panther, sambar, wild boar, pheasant, snow pigeon, kokla, green pigeon, monals etc.	-do-
Kedarnath, Chamoil	957	-do-	Sept.-Oct. May-Jun.
Chandraprabha, Varanasi (2nd home for Gir lions)	78	Tiger, panther, sambar, Indian gazelle, sloth bear, nilgai, pea-fowl, partridges,sand grouse etc.	Sept.-May
Katarniaghat, Bahraich	400	Tiger, panther, sambar, bear, chital, black buck.	Nov.-May

Ranipur, Benda	230	Tiger, panther, wild cat, sambar, hyena, fox, jackal, chital, chinkara, black buck etc.	Nov.-May
Chila, Garhwal	249	Tiger, panther, bear, elephant, chital, sambar, nilgai etc.	Nov -May
		West Bengal	
Lothian Island, 24-Parganas	38.00	Wild pigs, chital, otter, estuarine crocodiles, gangetic dolphin, water birds etc.	Dec -Feb
Halliday Island, 24-Parganas	5.95	Royal Bengal Tiger, chital, water birds etc.	-do-
Sajnakhali, 24-Parganas	362.40	Tiger, wild boar, chital, cormorant, open-bill, storks, snake bird, white ibis, purple heron, grey heron, green bitter, pelican etc.	July-Dec
Gorumara, Jalpaiguri	8.52	Rhino, elephant, gaur, tiger, sambar, hog deer, wild boar, varieties of birds.	Oct -Apr
Jaldapara, Jalpaiguri	115.53	Rhino, elephant, tiger, leopard wild boar, gaur, barking deer, hog deer, sambar & variety of birds.	Dec.-May
Mahanadi, Darjeeling	127.22	Tiger, elephant, gaur, sambar, hog, wild-boar, gibbons and a variety of birds.	Nov.-Apr.
Sunderbans, 24-Parganas (Tiger Sanctuary)	2585.00	Tiger, different species of deer, wild boar, estuarine crocodile, Gangetic dolphin.	Sept.-May

154. TOURISM

Tourism in India is handled by the Department of Tourism, in the Ministry of Tourism and Civil Aviation. It functions under a directorate of its own. The function of this directorate is both promotional and organisational. It is responsible, on the one hand, for attracting tourists by disseminating information within India and abroad about the places of tourist interest and, on the other, for improving conditions within the country, such as provision of better communication and transport facilities, and hotel accommodation to ensure convenience and comfort of the tourists. The Directorate works in close co-operation with the India Tourism Development Corporation which, as a public sector undertaking, is in charge of the commercial enterprises connected with tourism, such as construction and management of hotels, maintenance of taxi and long-distance coach services, construction and management of motels and restaurants

The emphasis in the Five-Year Plan 1980-85 will continue to be on building tourist infrastructure of accommodation and transport, entertainment facilities, the development of selected areas as mountain and beach resorts for attracting a larger volume of destination traffic, development of Cultural Tourism as represented by archaeological and historical monuments, development of Wild Life Tourism, Sports tourism, promotion of youth travel, etc.

A new orientation has been given to the tourism policy whereby equal emphasis is being laid in the Central Sector on the development of tourist facilities to benefit budget-minded tourists, both domestic and international, and the less affluent sections of society. With this in view, construction of Janata Hotels for providing comfortable, clean and inexpensive accommodation for middle income and budget tourists is under way. For the larger number of pilgrims visiting pilgrim centres, it is proposed to improve/expand/construct accommodation such as Dharmashalas/Sarais/Musafir-khanas etc. For this purpose, a *Bharatiya Avas Vikas Samiti* has been set up.

Tourist Arrivals. A total of 8,53,148 foreign tourists (excluding nationals of Pakistan and Bangladesh) visited India during 1981, registering an increase of 7.1 per cent over 1980. The gross foreign exchange earnings from tourism for the year 1981 are estimated at Rs. 564 crores at 1976-77 prices.

Hotel Accommodation. There are at present 22,300 rooms on the approved list of the Department of Tourism as against 21,384 rooms at the end of 1980-81. 159 hotel projects were approved and are under various stages of construction. On completion these would add 12,879 rooms to the existing stock of hotel rooms of approved category. 32 new hotels were classified during 1981-82 thus bringing the total number of classified hotels in the country to 218.

India Tourism Development Corporation

The India Tourism Development Corporation was set up on Oct. 1, 1966 by amalgamating three separate undertakings then in existence, namely, the India Tourism Transport Undertaking Limited, the Hotel Corporation of India Limited and the India Tourism Corporation Limited. The Ashoka Hotels Limited and Janpath Hotels Limited were merged with India Tourism Development Corporation Limited on March 28, 1970.

Re-orientation in Policy. With a view to speedy and effective realisation of the objectives of the Corporation, re-orientation in policy and planning strategy was introduced in 1980-81. Hitherto, the Corporation had primarily geared its efforts towards meeting the requirements of foreign tourists. Not much emphasis was given for providing facilities for the domestic tourists. Similarly, effective efforts were lacking to secure cooperation and active involvement of the States/State Tourism Development Corporation. As a matter of policy the Corporation is now laying equal emphasis on development of domestic tourism and actively associating the State Tourism Development Corporation in taking up tourism projects in the various States.

Network of ITDC Services. ITDC chain now consists of the Ashok Group of Hotels (21 hotels including 2 beach resorts), 3 forest lodges, 12 travellers lodges, 14 restaurants including 6 airport restaurants, 17 transport units, 7 duty free shops and 3 sound and light shows. The Corporation is also providing catering services at Western Court and State Guest House and Hospitality Centre at Hyderabad House, New Delhi, besides managerial services to 3 hotels namely, Hotel Mumtaz Ashok, Agra, Hotel Karnavati Ashok, Anmedabadand Hotel Pinewood Ashok, Shillong.

Accommodation Occupancy During 1980-81, by and large, the occupancies of the hotels and lodges were satisfactory. Janpath, Lodhi and Ranjit hotels operated at peak occupancies ranging between 86 to 95 per cent. Because of the expanded capacity available during part of the year, the occupancy of Ashok Hotel, New Delhi declined from 74 per cent in 1979-80 to 67 per cent in 1980-81, Akbar Hotel from 89 per cent to 77 per cent and that of LMP Hotel, Mysore from 55 per cent to 40 per cent during the same period. Qutab Hotel, Temple Bay Ashok Beach Resort, Mahabalipuram and Kalinga Ashok, Bhubaneswar improved their occupancy during this period from 65 per cent to 74 per cent, 43 per cent to 54 per cent and 53 per cent to 60 per cent respectively. Kovalam Ashok Beach Resort, Hotel Hassan Ashok and LVP Hotel, Udaipur maintained their occupancy at the same level as in 1979-80. Hotel Ashok, Bangalore had to face stiff competition from the private sector. Its occupancy declined from 81 per cent during 1979-80 to 76 per cent during 1980-81. Similarly, hotels at Pataliputra, Aurangabad, Khajuraho, Jaipur and Jammu continued to face competition from the private sector and operated at occupancies ranging between 34 per cent and 49 per cent. The occupancy of Varanasi Ashok declined from 64 per cent during 1979-80 to 58 per cent during 1980-81 mainly due to non-availability of some rooms during execution of the expansion work. The occupancy of Airport Ashok, Calcutta declined marginally from 69 per cent to 64 per cent during the same period.

Transport. The total fleet strength at the close of the year was 288 vehicles comprising 157 luxury cars, 64 Ambassador cars, 58 coaches and 9 mini coaches. The turnover of the Division increased substantially from Rs. 250.70 lakhs during the previous year to Rs. 287.68 lakhs during the year, representing an increase of 14.8 per cent over the previous year. This was mainly due to better and increased deployment of coaches. Despite increase in turnover, the Transport Division suffered a loss of Rs. 15.65 lakhs as against Rs. 6.11 lakhs in 1979-80, mainly on account of higher provision of depreciation of Rs. 5.68 lakhs on additions to the fleet.

particularly of 14 coaches, for which depreciation for the full year has been provided, although the new vehicles were in operation only for a part of the year. The impact of higher provision for gratuity and increase in fuel prices also contributed to the higher loss.

Tourist Centres in India*. Mount Abu (Rajasthan), Agra (UP), Ahmedabad (Gujarat), Ajanta and Ellora (Maharashtra), Ajmer (Rajasthan), Allahabad (UP), Almora (UP), Alwar (Rajsthan), Amritsar (Punjab), Aurangabad (Maharashtra), Badami (Karnataka), Bangalore (Karnataka), Baroda (Gujarat), Belur (Karnataka), Bharatpur (Rajasthan), Bhubaneswar (Orissa), Bijapur (Karnataka), Bikaner (Rajasthan), Bombay (Maharashtra), Brindavan (UP), Bodh Gaya (Bihar), Calcutta (W. Bengal), Cape Comorin (T. Nadu), Chandigarh (Haryana), Conjevaram (T. Nadu), Chittor (Rajasthan), Cochin (Kerala), Coonoor (T. Nadu), Darjeeling (W. Bengal), Delhi—Old and New— (Territory of Delhi), Ernakulam (Kerala), Fatehpur (UP), Golconda (AP), Gwalior (MP), Halebid (Karnataka), Hampi (Karnataka), Hardwar (UP), Hyderabad-Secunderabad (AP), Jaipur (Rajasthan), Jamshedpur (Bihar), Jodhpur (Rajasthan), Jog Falls or Gersoppa Falls (Karnataka), Junagadh (Gujarat), Kashmir (J&K State), Khajuraho (MP), Kodaikanal (T. Nadu), Kolar Gold Fields (Karnataka), Konarak (Orissa), Kottayam (Kerala), Kovalam (Kerala), Kulu Valley (Himachal Pradesh), Lucknow (UP), Madras (T. Nadu), Madurai (T. Nadu), Mahabeleswar (Maharashtra), Matheran (Maharashtra), Mathura (UP), Mussoorie (UP), Mysore City (Karnataka), Nalanda (Bihar), Nandidurg (Karnataka), Nasik (Mahrashtra), Ootacamund or Ooty (T. Nadu), Pachmarhi (MP), Patna (Bihar), Poona (Maharashtra), Porbandar (Gujarat), Prabhas Patan (Gujarat), Puri-Jagannath Puri (Orissa), Rameswaram (T. Nadu), Ranchi (Bihar), Sanchi (MP), Santiniketen (W. Bengal)

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* The entries in brackets indicate the States in which the centres are situated.

155. NATIONAL AWARDS

National Awards form four groups: (i) Civilian Awards, (ii) Gallantry Awards, (iii) Distinguished Service Awards and (iv) Arjuna Awards.

Civilian Awards. Civilian awards fall into four grades, *Bharat Ratna, Padma Vibhushan, Padma Bhushan* and *Padma Shri.*

Civilian awards were discontinued by the Janata government in July 1977 but were re-instituted by the Congress government under Mrs. Indira Gandhi as from January 26, (Republic Day) 1980.

Bharat Ratna. This is the highest award in India and is made for exceptional work for the advancement of art, literature and science and in recognition of public service of the highest order. The decoration is in the form of a peepal leaf about 5.8 cm long, 4.7 cm wide and 3.1 mm thick. It is of toned bronze. On one side there is a replica of the sun, below which the words "Bharata Ratna" are inscribed in Hindi. On the other side are the National Emblem and motto, also in Hindi. The emblem, the sun and the rim are of platinum.

Padma Vibhushan. This award is made for exceptional and distinguished service in any field, including government service. The decoration is circular in design with a geometrical pattern, super-imposed on the circle. On one side is a lotus flower, with the inscription "Padma Vibhushan" in Hindi. On the other side are the National Emblem and motto.

Padma Bhushan is awarded for distinguished service in any field including government service. It has the same design as "Padma Vibhushan", the inscription alone being changed to "Padma Bhushan".

Padma Shri is given for distinguished service in any field including service rendered by government servants. The design is the same as the design of "Padma Bhushan", the inscription being altered to "Padma Shri".

Civilian Awards 1983

Bharat Ratna, the country's highest award has been posthumously conferred on Acharya Vinobha Bhave, the leader of the Bhoodan Movement in India.

Padma Vibushan. (no award for 1983)

Padma Bhooshan 1983. Lt. Gen. Adi Meherji Sethna, Vice Chief of the Army Staff, Prof. Arun Kumar Sharma, Professor of Botany, Calcutta; Mr. Benudhar Sarmah, Assamese writer, Gauhati (posthumous); Raja Bhalindra Singh, President, Indian Olympic Association; Prof. K.G. Ramanathan, Professor of Mathematics, Bombay; Mr. K. Sankaran Nair, Secretary-General, Special Organising Committee, Asian Games 1982; Mr. K.T. Satarawala, Vice-Chairman, Special Organising Committee, Asian Games; Dr. Nagendra, Hindi literateur, Delhi; Prem Nazir, Malayalam film actor; Sir Richard Attenborough, actor-producer-director; Singanallur Puttaswamaiah Muthuraj (Raj Kumar), Kannada film actor, Dr. Subodh Chandra Sengupta, retired Professor of English, Calcutta; Lt. General Suraj Prakash Malhotra, General-Officer-Commanding-in-Chief (Retd.) New Delhi; Mr. Swaraj Paul, social worker and philanthropist; Mr. Umrao Singh, Vice-Chairman, Special Organising Committee, Asian Games, Sri. V. Doreswamy Iyengar, Carnatic musician, Bangalore; Sri. Vishnu Govind Jog, musician and instrumentalist, Calcutta.

Padma Shri. Mr. A. Sawihlira, science promotion officer, Mizoram; Mr. Addepalli Servi Chetty, social worker, West Godavari distict (Andhra Pradesh); Miss Ahilya Chari, educationist; Mr. Amitabha Chaudhuri, journalist and writer, Calcutta; Dr. Attar Singh, Director of Sheikh Farid Chair, Punjab University; Dr. Autar Singh Paintal, physician, Delhi; Mr. C. P. Joshi, (sports promotion) Chand Ram, athlete (20 km walk) Mr. Dada Shewak Bhojraj, social worker, Thana (Maharashtra); Dr. Dara Kaikshushroo Karanjavala, nephrologist and kidney transplant surgeon, Bombay; Dr. Dharam Veer Sachedeva, dental surgeon, New Delhi; Mrs. Eliza Nelson, hockey player; Mr. Gulam Mohammed Sheikh, painter, Baroda; Mr. Gulam Rasool Khan, carpet manufacturer, Srinagar; 'Guru' Hanuman, wrestling coach, New Delhi; Mr. H.L. Kapur, (sports promotion) Mr. H.N. Siddique, scientist (oceanography), Goa; Mr. Habib Tanvir, dramatist, New Delhi; Mr. Handel Manuel, conductor of Western music, Madras; Mr. J.M. Thakore, service in the field of local self-government, Ahmedabad; Mr. K.S. Bains, additional secretary-general, special organising committee, Asian Games, 1982; Dr. K.V. Peter SJ, Postal service, Dindigul; Mrs. Kanwal Sidhu (nee Randhawal, musician, New Delhi (posthumous); Mr. Komal Kothari, folklore scholar, Jodhpur; Mr. Lairenmayum Damu Singh, Manipuri martial art, Manipur; Ms. M.D. Valsamma, athlete; Mr. M.P. Nachimuthu (cooperative movement), Erode (Tamil Nadu); Mr. Manik Hundraj Lila Ram "Dukhyal". Writer Adipur (Kutch); Mr. N.S. Thappa, film producer, Bombay; Dr. Narla Tata Rao, power engineer, Hyderabad; Dr. Nekibuz Zaman, principal, Assam Medical College; Mr. Nepal Mahata, dancer, Purulla, West Bengal; Miss Pamela Cullen, films publicity, London; Dr. Prakash Chandra, orthopaedic surgeon, New Delhi; Dr. Purshottam Lal Wahi, cardiologist, Chandigarh; Dr. R. Ganapati, surgeon and leprosy specialist, Bombay; Shri Raghu Bir Saran, "Mitra", poet and novelist, Meerut; Dafadar Raghubir Singh, equestrian, 61 Cavalry, Army; Mr. Raghubir Singh, photographer; Mr. Raghuraj, Chairman and Managing Director, Air India; Dr. (Kumari) Raj Baveja, Surgeon, Allahabad; Dr. S. S. Badrinath, Eye Surgeon, Madras; Mrs. Saleha Abid Hussain, writer, New Delhi; Mr. Shri Saroj Raj Choudhury, field director, project tiger, Orissa (posthumous); Sri Seerkazhi S. Govindarajan, musician, Madras; Ustad Sharafat Hussain Khan, vocalist, Alligarh; Dr. Shishupal Ram, Paediatrician, Patna; Sardar Sobha Singh, painter, Dharamsala; Sri Sohan Singh, musician, Patiala and Vijay Amritraj, tennis player, Madras.

Gallantry & Distinguished Service Awards 1983

Gallantry awards for concpicuous bravery in the presence of the enemy fall into two groups (i) Param Vir Chakra, Maha Vir Chakra and Vir Chakra, in that order and (ii) Asok Chakra, Kirti Chakra and Shaurya Chakra.

Distinguished Service Awards are given to the personnel of the Armed Forces for meritorious service. Param Vishishta Seva Medal (PVSM) is the highest decoration in this category, followed by Ati Vishishta Seva Medal (AVSM) and Vishishta Seva Medal (VSM) Other decorations include Sena Medal, Nao Sena Medal, Vayu Sena Medal, etc.

In 1983 the awards given were Param Vishishta Seva Medal (21) Ati Vishishta Seva Medal (48), Bar to AVSM (1), Vishishta Seva Medal (106) Bar to VSM (1), Kirti Chakra (3), Shaurya Chakra (25), Sena Medal (42), Nao Sena Medal (14), Vayu Sena Medal (14) and Bar to Vayu Sena Medal (14)

Param Vishishta Seva Medal (PVSM)

Lt. Gen. Arunkumar Shridhar Vaidya, MVC, AVSM, armoured corps; Lt. Gen

Yeshwant Dattatreya Sahasrabuddhe, Army Service Corps; Lt. Gen. Man Mohan Lal Ghai, engineers; Lt. Gen. Kanwal Kishan Hazari, AVSM, artillery; Lt. Gen. Manohar Singh Sodhi, Signals; Lt. Gen. Tilak Bahadur Nanda, Engineers, Vice-Admiral Sardari Lal Sethi, AVSM, MV; Vice-Admiral Anil Kumar Bhatia; AVSM, VSM; Surgeon Vice-Admiral Gopala Kuppuswamy, VSM (retired); Air Marshal Kanwar Iqbal Singh Chabra, AVSM, flying (navigator); Air Marshal Minoo Jehangir Dotiwalla, flying (pilot); Air Marshal Satish Chandra Lal, aeronautical engineering (electronics); Air Marshall Kapil Dev Chandha, VM, flying (pilot); Major-General Narinder Singh, Armoured Corps; Major-General Sudarshan Lal Malhotra, AVSM, Infantry; Major Naresh Kumar, Artillery; Major-General Vijay Kumar Nayar, SM, Infantry; Major-General Ashoke Banerjee, VRC, Army Medical Corps; Major-General Stanley William Burrett, AVSM, engineers (retired); Major-General Brij Nath Dhar, Army Ordnance Corps; Major-General (Miss) Vattarangath Gouri, Military Nursing Service (retired); and Air Vice-Marshal Shri Krishna Chandra Gupta, VSM, administrative.

Ati Vishishta Seva Medal (AVSM)

Vice-Admiral Jayant Ganpat Nadkarani, Major-General Devinder Nath Chibber, Army Education Corps; Major-General Lalgudi Mahalingam Rajgopal, Electrical and Mechanical Engineers, Major-General Jag Mohan Raj, engineers; Major-General Purushottam Lal Kher, VRC, SM, Mechanical Infantry; Rear-Admiral Radhey Shyam Sharma, Brigadier Anand Kumar Pandya Army Service Corps; Brigadier Gurdayal Singh, Electrical and Mechanical Engineers; Brigadier Arjun Verma, VSM, Signals; Brigadier Bishweshwar Singh Bisht, Artillery; Brigadier Lakshmi Narain Sabherwal, Infantry; Brigadier Virender Pratap, Army Ordnance Corps; Brigadier Ramesh Chander, Electrical and Mechanical Engineers; Brigadier Surinder Nath, VSM, Rajputana Rifles; Brigadier Avtar Singh Sekhon, Military Farms Corps; Brigadier Narendra Kumar, Army Service Corps.

Brigadier Din Bandhu Mukherji, engineers; Brigadier Satjit Singh, VSM, Artillery; Brigadier Kumar Debakrama Majumder, infantry; Brigadier Dalip Singh Sidhu, VSM, infantry; Brigadier Ishwar Dutt Vasishtha, infantry; Brigadier Basant Kumar Mahapatra, Armoured Corps; Brigadier Ravinder Sharma, Armoured Corps; Brigadier Harwant Singh, Armoured Corps; Brigadier Sandip Kumar Chaudhuri, infantry; Brigadier Yogendra Kumar Vadehra, infantry; Brigadier Ashok Krishna, infantry; Brigadier Vasanta Rao Raghavan, infantry; Brigadier Ishwar Chandra Narang, Army Medical Corps (retd.) Com. Surendra Mohan Misra; Com. Vasant Laxman Koppikar; Surgeon Commodore Joginder Singh Lamba; Commodore Viswanath Ravindranath, NM, VSM (retired); Air Commodore Bangalore Venkataramaiah Jaya Rao; Aeronautical Engineering (electronics); Air Commodore Anadi Shankar Sarkar, VM, Aeronautical Engineering (Mechanical); Air Commodore Shyam Chand Mehra, VSM, Aeronautical Engineering (Electronics); Air Commodore Kotarapurath Govind Mohanchandra, administrative; Air Commodore Jagdish Kumar Seth, VM, flying (pilot); Air Commodore Man Mohan Singh, VM flying (pilot); Air Commodore Inder Dev Bhalla flying (pilot); Air Commodore Amolak Ram Anand, medical (retired).

Colonel Vijay Prabhakar Ranadive, Army Service Corps; Colonel Narsinha Venkatrao Kamat, Army Dental Corps; Group Captain Sheerpad Achyut Ranade, accounts; Group Captain Dalip Singh Sabherwal, VM, flying (pilot); Group Captain Indrakanty Gopala Krishna, VSM, aeronautical engineering (mechanical); Group Captain Prithvi Singh Brar, VM, flying (pilot); Commander Arogyaswami Joseph Paulraj, VSM.

Bar to AVSM

Birg. Jagjit Singh, AVSM, VSM, artillery.

Vishishta Seva Medal (VSM)

Brig. Rabinder Nath Bhalla, Infantry; Brig. Darshan Singh, Army Physical Training Corps; Brig. Pullat Mukundan Menon, Electical and Mechanical Engineers; Col Satish Chander Chatrath, Army Ordnance Corps; Col Ramdas Bodhram Nadgir, Army Ordnance Corps; Col Bharat Bhushan Vishnoi, Signals; Col Krishna Murari Singh, Infantry; Col Sundararajan Padmanabhan, Artillery; Col Sushil Kumar Vij, Signals; Col J. Master, Parachute; Col Rajagopal Senthamarai Kanan, Electrical and Mechanical Engineers; Col Basudeb Rautray, Army Medical Corps; Col (Mrs) Nirmal Ahuja, Army Medical Corps; Col Krishna Nand Sardane, Army Education Corps.

Capt Jasbir Singh Virk, AG; Capt Puthenmadathil Ittyerah Oommen; Lt Col Kamaljit Singh, Armoured Corps; Lt Col Harinder Singh Sodhi, Armoured Corps; Lt Col Ram Krishan Sharma, Artillery; Lt

Col Yadav Raj Retley, Artillery; Lt Col Gurpal Singh Chhatwal, Artillery; Lt Col Sushil Kumar Sarda, VRC Mahar; Lt Col Virender Mohan Mehta, Gorkha Rifles; Lt Col Harkirat Singh, Grenadiers; Lt Col Thelapanda Muddapa Muthappa, Bihar; Lt Col Gurdev Singh, Dogra; Lt Col K.P. Balakrishnan Nambiar, Madras; Lt Col Amal Kumar Sanyal, Gorkha Rifles; Lt Col Pinaki Basu, Bihar; Lt Col Joginder Jaswant Singh, Maratha Light Infantry; Lt Col Raj Kumar Singh, Garwal Rifles; Lt Col Abdul Rasul Khan, Grenadiers; Lt Col Kailash Chandra Dhingra, Engineers.

Lt. Col Sharad Chandra Abajig Deshpande, Electrical and Mechanical Engineers; Lt. Col Kona Kanti Ghosh, Electrical and Mechanical Engineers, Lt Col. Vasant Vishnu Prabhudesai, Electrical and Mechanical Engineers; Lt Col Sajal Kanti Ghosh, Electrical and Mechanical Engineers, Lt Col Girdhar Gopal Agrawal, Army Service Corps; Lt Col Baindur Nagesh Rao, Army Ordnance Corps; Lt Col B. Rathnakar Shetty, Remount Veterinary Corps; Lt. Col Satya Prakash Malhotra, Intelligence Corps; Lt. Col. Mahendra Kumar Seth, Army Medical Corps; Lt. Col. Guntur Buchy Venkata Lakshmana Shastry, Punjab (retired); Subedar Major (Honorary Captain); Vishwanath Bhosle, Vir Chakra, Mahar.

Commander Mahendra Singh Rawat; Commander Kewal Krishnan Gulati; Commander Perumpacheruvilla Johnson Jacob; Surgeon Commander Asok Kumar Chatterjee; Commander Buddhadeb Sengupta; Acting Commander Datla Sai Prasad Varma; Commander Prit Pal Singh; Wing Commander Rajinder Kumar Chaudhary, Indian Air Force; Wing Commander Jaswant Singh Kumar (logistics); Wing Commander Ghanshyam Gururani, Aeronautical Engineering (mechanical); Wing Commander Virendra Kumar Jain, Aeronautical Engineering (mechanical); Wing Commander Swinder Mohan Singh Chadha, Aeronautical Engineering (mechanical); Wing Commander Konadaiah Rampati, Aeronautical Engineering (mechanical); Wing Commander Surinder Mohan Bhatia, Aeronautical Engineering (mechanical); Wing Commander Satish Govind Inamdar, flying (pilot); Wing Commander Dilip Kamalkar Parulkar, VM, flying (pilot); Wing Commander Sharanjit Singh, Aeronautical Engineering (electronics); Wing Commander Sundara Krishna Suresh Sitaram, Aeronautical Engineering (electronics); Wing Commander Virendra Pradhan flying (pilot); Major Vijay Kumar Bakshi, Artillery.

Bar VSM

Col. Jagdish Narain, engineers.

Arjuna Awards

No awards were announced for 1983 on Republic Day.

Film Awards

(See Page. 525)

Invention Awards 1983

The Republic Day awards include awards for invention. Cash prizes for these awards total Rs. 1 lakh. These are given to candidates selected by the National Research Development Corporation of India. There were 18 awardees in 1983 which include a team of five scientists from the Central Leather Research Institute, Madras and another five scientists from the Indian Space Research Organization (ISRO).

Jnanpith Award

The Jnanapith award, the most prestigious literary award in India, is given to reputed writers in any Indian language.

The Punjabi Poetess, Amrita Pritam, has been awarded the Bharatiya Jnanpith award for 1981. Amrita Pritam won the award for her poetry collection *Kagaz ke Kanwas.*

Lalit Kala Akademi Awards 1982

The Award consists of Rs. 5000/- in cash and a certificate.

	Name of the artists	*Title*
1	Mahendra M. Patel	Painting No. 9 (Painting)
2	Bhagwan Chavan	No Title (Painting)
3	S. Kanniappan	Mushroom (Sculpture)
4	Shail Choyal	Rangilo Joben (Painting)
5	Pammi Lall	Silver Egg I (Painting)
6	Shyamal Datta Ray	Overthrown (Painting)
7	Manu Parekh	Eclipse Two (Painting)
8	R.P. Dabral	Barren Hills I (Painting)
9	A.J. Singh Bhogal	'Apna Desh' (Painting)
10	V.R. Khajuria	"________" 82 (Sculpture)

Sahitya Akademi Awards 1982

Language	*Book (Subject)*	*Author*
Assamese	*Mamare Dhara Tarowal Aru Dukhan Upanyasa* (Novel)	Mamoni Raiason Goswami
Bengali	*Amritasya Putree* (Novel)	Kamal Das
Dogri	*Qaidi* (Novel)	Deshbandhu Dogra 'Nutan'
English	*The Last Labyrinth* (Novel)	Arun Joshi
Gujarati	*Dilero Dhal* (Poetry)	Priyakant Maniar
Hindi	*Viklang Shraddha Ka Daur* (Satire)	Hari Shandkar Parsai
Kannada	*Vyshakha* (Novel)	Chaduranga
Kashmiri	*Natak Truche* (Drama)	Motilal Kemmu
Konkani	*Khabari* (Essays)	Laxmanrao Sardessai
Maithili	*Marichika* (Novel)	Lily Ray
Malayalam	*Payyankathakal* (Short Stories)	V.K.N. (Thiruvilvamala)
Manipuri	*Pistal Ama Kundallei Ama* (Short Stories)	E. Dinamani Singh
Marathi	*Saundaryanubhav* (Literary Criticism)	Prabhakar Padhye
Nepali	*Bisirayako Sanskriti* (Essays)	M.M. Gurung
Oriya	*Hasyarasar Natak* (One Act Plays)	Gopal Chhotrai
Punjabi	*Amar Katha* (Short Stories)	Gulzar Singh Sandhu
Rajasthani	*Chasmadith Gawah* (Short Stories)	Moolchand 'Pranesh'
Sanskrit	*Visvabhanu* (Epic)	P.K. Narayana Pillai
Sindhi	*Muhinji Hayatia-Ja-Sona Ropa Warqa* (Autobiography)	Popati Hiranandani
Tamil	*Manikkodik Kalam* (Literary History)	B.S. Ramaiya
Telugu	*Swarna Kamalaalu* (Short Stories)	I. Saraswati Devi
Urdu	*Zikr-O-Fikr* (Literary Criticism)	Gian Chand Jain

Box 56

Smoking Epidemic

Geneva, (AP)

World Health Organisation officials, elated over the eradication of smallpox and encouraged by progress in controlling other diseases, are growing concerned about the spread in the third world of what it calls the "smoking epidemic".

Statistical evidence is mounting at WHO headquarters here that a steady increase in the consumption of cigarettes in developing countries is accompanied by soaring rates of lung cancer and cardiovascular diseases.

The statistics, admittedly incomplete, suggest that tobacco use has been climbing by an overall five per cent annually in the third world in recent years while it has slowed in the West.

In India, consumption of cigarettes has gone up 90 per cent in 20 years, in Pakistan 60 per cent in 10 years and in Sri Lanka it is increasing by an annual eight per cent, according to WHO surveys. In Bangladesh, 71 per cent of men and 20 per cent of women in "lower socioeconomic groups" smoke.

In some countries, growth of cigarette consumption has been spectacular. Sales in Thailand, for example, increased by 50 per cent between 1970 and 1977, with one person in five over the age of ten smoking. People there spend one-fifth of an average income on cigarettes.

Lung cancer is now the most common type of cancer among men in the Philippines, and is slowly increasing among women. In Pakistan, it jumped in four years from fourth to first place in the list of the most often observed malignant growths.

Aug. 23, 1982.

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&
UNION TERRITORIES

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156. STATES AND TERRITORIES

Basic Data

The Union of India is made up of 22 States and 9 Union Territories.

Table 156

	States	*Capital*	*Area (sq. km.)*	*Population‡ (1981)*	*Percentage to All India†*
1	Andhra Pradesh	Hyderabad	276,754	53,403,619	7.81
2	Assam	Dispur	78,523	19,902,826	2.91
3	Bihar	Patna	173,876	69,823,154	10.21
4	Gujarat	Gandhinagar	195,984	33,960,905	4.97
5	Haryana	Chandigarh	44,222	12,850,902	1.88
6	Himachal Pradesh	Simla	55,673	4,237,569	0.62
7	Jammu & Kashmir	Srinagar/Jammu*	222,236	5,981,600	0.87
8	Karnataka	Bangalore	191,773	37,043,451	5.42
9	Kerala	Trivandrum	38,864	25,403,217	3.71
10	Madhya Pradesh	Bhopal	442,841	52,131,717	7.62
11	Maharashtra	Bombay	307,726	62,693,898	9.17
12	Manipur	Imphal	22,356	1,433,691	0.21
13	Meghalaya	Shillong	22,489	1,327,874	0.19
14	Nagaland	Kohima	16,572	773,281	0.11
15	Orissa	Bhubaneswar	155,842	26,272,054	3.84
16	Punjab	Chandigarh	50,376	16,669,755	2.44
17	Rajasthan	Jaipur	342,214	34,102,912	4.99
18	Sikkim	Gangtok	7,300	315,682	0.05
19	Tamil Nadu	Madras	130,609	48,297,456	7.06
20	Tripura	Agartala	10,491	2,060,189	0.30
21	Uttar Pradesh	Lucknow	294,413	110,858,019	16.21
22	West Bengal	Calcutta	87,853	54,485,560	7.97

	Union Territories	*Headquarters*	*Area (sq. km.)*	*Population 1981*	*Percentage to All India*
1	Andaman & Nicobar Islands	Port Blair	8,293	188,254	0.03
2	Arunachal Pradesh	Itanagar	83,578	628,050	0.09
3	Chandigarh	Chandigarh	114	450,061	0.06
4	Dadra & Nagar Haveli	Silvassa	491	103,677	0.02
5	Delhi	Delhi	1485	6,196,414	0.91
6	Goa, Daman & Diu	Panaji	3813	1,082,117	0.16
7	Lakshadweep	Kavaratti	32	40,237	0.01
8	Mizoram	Aizwal	21,090	487,774	0.07
9	Pondicherry	Pondicherry	480	604,136	0.09

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* Srinagar (Summer Capital) Jammu (Winter Capital)

† Uttar Pradesh, Bihar and Madhya Pradesh account for 34.05 per cent or more than one-third of the total population of India. ‡ Provisional

DEMOGRAPHIC TRANSITION

The 1981 Census count placed the Indian population provisionally at 684 million as on the first of March. The population had grown at an annual average rate of 0.83 per cent between 1901 and 1951 and at a more rapid pace of 2.13 per cent in the post-Independence period between 1951 and 1981. If this rate continues until the year 2000, the Indian population would be 1025 million, about one-half more than what it is today.

The above figures show that India is in a state of demographic transition. Demographic transition indicates the passage of a population from high mortality and fertility rates to low mortality and low fertility.

There are many stages in this transition beginning with a declining mortality and continuing fertility to a stage where both mortality and fertility rates decline more or less at the same rate and keep the population stable over a period of time. The difference is essentially a difference of ratios between mortality and fertility rates in a population group. The Indian nation is not a population group in this sense. Rather, it is made up of various population groups. These population groups tend to be so small that even a State may contain a large number of such groups. But at present, the States remain the lowest population group which can be demographically assessed. On this basis, the 15 major States (excluding Assam, where the census has not been completed) may be grouped into four: (i) Jammu & Kashmir, Rajasthan, Uttar Pradesh and Bihar, (ii) Karnataka, Punjab and Andhra Pradesh, (iii) Haryana, Gujarat, Madhya Pradesh, Maharashtra and West Bengal and (iv) Kerala, Orissa and Tamil Nadu.

These 15 states contain 94.2 per cent of India's population. Only three states among them (Kerala, Orissa & Tamil Nadu) with a total population of 100 million or 15.5 per cent, are in an advanced stage of transition with a declining growth rate below 2 per cent. The growth rates of another five states (group iii) with a total population of 216 million or 33.6 per cent of the 15-state population, have started declining, though still above 2 per cent. The remaining seven states (groups i & ii) with slightly above half the population (50.9 per cent), are just entering the demographic transition with declining mortality but with no significant decline in fertility.

Growth Rates 1971-1981. The growth rate for 1971-1981 averages at around 2.48 per annum for all India. As against this, the growth rate for group (i) is above 2.5 and for group (ii) around 2.5, both increasing trends. For group (iii) the growth rate averages below 2.5. Though this is still an increasing growth rate, it is on the low side. Group (iv) shows an average of less than 2, definitely a declining trend.

It may, therefore, be said that group (i) is in the earliest stage of transition with a declining mortality but a stable fertility. Group (ii) is next in the order of progression with a declining mortality. Their fertility is also on the decline but at a slower rate than that of mortality. Consequently this group still qualifies for being on the high side, with a slightly increasing trend in growth rate. Group (iii) shows declines in both mortality and fertility. There is a near parity between these rates which shows a declining trend in growth rates. Group (iv) shows a fertility which just about compensates for loss in mortality, thus leading to a steady growth rate, which is sometimes called replacement rate. This group has thus reached the last stage in transition.

I. STATES

157. ANDHRA PRADESH

Physiography. Andhra Pradesh is the fifth largest State in India, both in respect of area and population. Bounded by MP and Orissa in the north, the Bay of Bengal in the east, T. Nadu and Karnataka in the south and Karnataka and Maharashtra in the west, AP forms the major link between the north and the south of India. The northern area of AP is mountainous with an annual rainfall of 45 to 50 inches. The highest peak *Mahendragiri* rises 4920 ft. above the sea level. As we go further south, the rainfall comes down to 20 inches annually. The climate is generally hot and humid. AP is principally fed by the south west monsoon, the north east monsoon contributing about one-third of the rainfall.

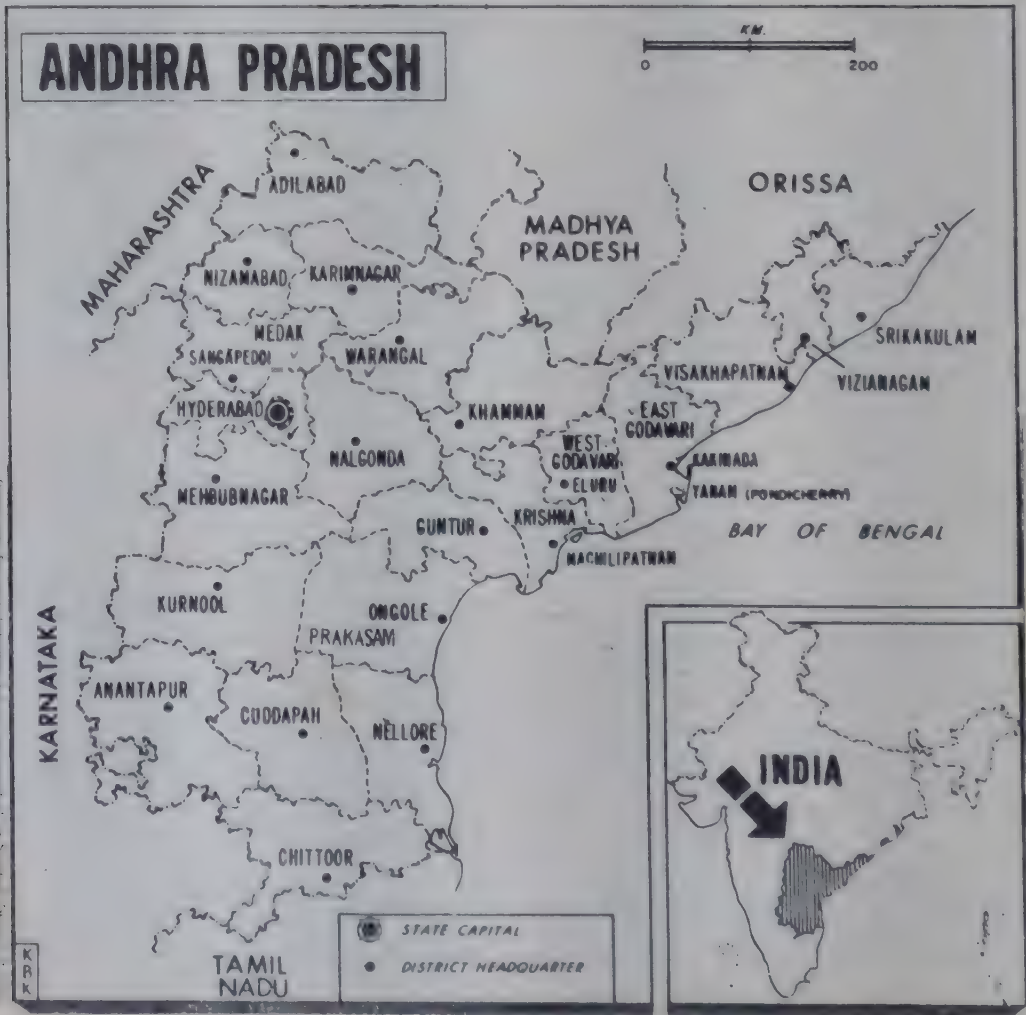
The State may be divided into three distinct geographical units. 1. *Coastal Plains*. Along the coast there is a low-lying area which is wider in the middle and tapers off into a narrow strip to the north. The region consists of the deltas built by the Krishna and the Godavari rivers. 2. *Eastern Ghats*. The Eastern Ghats are a chain of broken hills. In the north the Ghats spread out and reach elevations of 900 m. to 1500 m. The hills are wooded but the vegetation is poor due to porous soils and low precipitation. 3. *The Peneplain.* Between the Eastern Ghats and the coastal plains lies this area which has been reduced almost to a plain by erosion. The general feature of this region is that of graded valleys and isolated hillocks breaking the monotony of the plains.

Rivers. The Krishna and the Godavari are the major river systems in the State. The Godavari is the largest and the broadest river of South India. The Tungabhadra is an important tributary of the Krishna. Other important rivers are the Pennar, Vamsadhara and the Nagavali. All these rivers are rain-fed, and are of great economic significance to the State because of their rich hydro-power and irrigation potential.

History. The history of Andhra Pradesh is the history of the Andhras. The word 'Andhra' is equally applicable to the land, the people and the language, although the language in course of time developed a name of its own—*Telugu.*

The Andhras, originally an Aryan race, migrated to the south of the Vindhyas where they mixed with the non-Aryan stocks. Andhra Pradesh first enters history as part of the great Mauryan empire. On the death of Asoka, the Mauryan emperor, an Andhra chieftain, Satavahana, established a small independent kingdom, round about modern Hyderabad. The Satavahana dynasty produced great rulers and conquerors who converted the little principality into a mighty empire, that covered the whole of Deccan, Maharashtra, Malwa and Kalinga.

The age of the Satavahanas who ruled from the middle of the third century BC to the first quarter of the third century AD is the golden age of Andhra desa. The period was marked by great literary and artistic activities and expansion of trade and commerce across the seas. Gautamiputra and Pulamayi are two of the greatest Satavahana rulers.



The Pallavas rose on the ruins of the Satavahanas, but they remained south of the Krishna. Between the Krishna and the Godavari a new kingdom, Vengi, came into existence, while north of the Godavari, Kalinga again became independent.

In the seventh century, AP passed under the Eastern Chalukyas. It was during the Eastern Chalukyan era that Telugu literature opened out on its own with the composition of the Telugu *Mahabharata*. The Telugu language also acquired a script of its own during this period.

In the 13th century, the Kakatiyas, with their capital at Warrangal, dominated Andhra desa. In 1323, the Tughlak Sultan of Delhi captured the Kakatiya ruler and ended the dynasty. The Tughlaks never cared to annex the Kakatiyan dominions and four local kingdoms arose out of the old Kakatiyan empire.

One of these kingdoms was Vijayanagar. The Vijayanagar empire stood as a bulwark against Muslim expansionism for more than 200 years. Under Krishna Deva Raya (1510—1530), the greatest of the Vijayanagar kings, the empire reached the pinnacle of its glory. But while the southern regions of Andhra Pradesh remained under Vijayanagar, the northern parts were under the Muslim Bahmani sultanate. Almost from the outset, the Hindu kingdom of Vijayanagar found itself pitted against the Muslim sultanate. The Bahmani sultanate disintegrated into 5 separate sultanates in 1527. These were: 1) Imad Shahi dynasty of Berar, 2) the Nizam Shahis of Ahmadnagar, 3) Adil Shahis of Bijapur, 4) the Qutb Shahis of Golconda and 5) the Barid Shahis of Bidar. The Berar dynasty (Imad Shahis) was absorbed into Ahmadnagar in 1547.

Vijayanagar had to contend with these sultanates time and again. Sometimes Vijayanagar joined one sultan against another. These tactics finally led to a grand alliance of the sultanates of Ahmadnagar, Bijapur, Golconda and Bidar against Vijayanagar. On 23rd January, 1565 the Deccan sultans humbled the mighty Vijayanagar army at the battle of Talikota. Sewell, the historian of the Vijayanagar Empire, remarks "The battle of Talikota was not a defeat merely; it was a cataclysm".

The Qutb Shahis of Golconda laid the foundations of the modern city of Hyderabad. Emperor Aurangzeb routed the Qutb Shahis and appointed Asaf Jah as the Governor of Deccan. As the Mughal Empire tottered under Aurangzeb's successors, the Asaf Jahis made themselves independent rulers under the title of Nizam. The Nizams became involved in the Anglo-French wars in the Deccan and had finally to enter into a subsidiary alliance with the British in 1800.

Formation of the State. Andhra Pradesh is the first State in India that has been formed on a purely linguistic basis. When India became independent, the Andhras, that is, the Telugu-speaking people, were distributed in about 21 districts, 9 of them in the Nizam's Dominions and 12 in the Madras Presidency. In 1952-53 the Andhras started an agitation for the separation of Telugu-speaking districts from the composite Madras State and their formation into a separate Andhra State. The agitation was dramatised by the fast-unto-death of an Andhra patriot, Potti Sriramulu. The death of Sriramulu compelled the Govt. of India to concede the demand for a separate Andhra State. On Oct. 1, 1953, 11 districts of the Madras State were put together to form a new Andhra State with Kurnool as capital.

On Nov. 1, 1956 in accordance with the recommendations of the States Reorganisation Commission, the Andhra State was enlarged, by the addition of nine districts formerly in the Nizam's Dominions. Hyderabad, the former capital of the Nizam, was made the capital of the enlarged Andhra State. The State lost about 205 sq. km in 1960 when its southern border with Tamilnadu was redrawn as per Pataskar's award.

AP thus consisted of three distinct regions: (1) coastal region, made up of eight districts, generally called *Andhra*, (2) the interior region, consisting of four districts collectively known as *Rayalaseema* and (3) *Telengana* region, consisting of the capital of Hyderabad and nine adjoining districts.

The absorption of Telengana into AP raised a major internal problem, namely a separate identity for Telengana within the Andhra State. The Telengana region was economically and culturally backward compared to the coastal areas of Andhra Pradesh. The Telengana people feared that in the new State, they would be overwhelmed, politically and economically, by the people of coastal Andhra. Their fears in this regard were voiced by the States' Re-organisation Commission as follows: "It will be in the interest of Andhra, as well as Telengana, if, for the present the Telengana area is constituted into a separate State to be known as Hyderabad State" with the provision for its unification with Andhra, later on. The Commission pointed out that "if, however, our hopes for the development of the environment and conditions congenial to the unification of the areas do not materialise and if public opinion in Telengana, crvstallises itself against the unification of the two States, Telengana will have to continue as a separate State".

But the Union Government under Pandit Nehru was opposed to the partition of the State in any manner. Nevertheless, the sentiments of the Telengana people were recognised by the amendment of Art. 371 of the Constitution (1956), which provided for a regional Committee for Telengana, within the framework of the Andhra State.

From 1969 to 1972 AP was rocked by riots, first in Telengana, then in Andhra. The popular ministry under Narasimha Rao, unable to stem the tide of rising riots, resigned on Jan. 17, 1973. The President took over the Government on Jan. 18, 1973. With the assumption of government by the President, the riots began to subside.

What emerged from the riots was a demand for the partition of the State into two. The Central Government refused to consider the question of bifurcation. A six-point formula was put forward by the Prime Minister Mrs. Indira Gandhi as a compromise. The formula was generally accepted and peace was restored in the State. President's rule was terminated on 10th Dec. 1973, when a popular ministry under J. Vengal Rao took over.

The six-point formula has been incorporated into the Constitution as the Thirty-second Amendment 1973.

Administration. The legislature consists of two houses, the Legislative Assembly and the Legislative Council. The strength of the Assembly is 295 and that of the Council 90.

Taking into account the new districts created recently—Ranga Reddy district on Aug. 15, 1978 (from out of Hyderabad district) and Vizianagaram district on June 1, 1979 (from out of Visakhapatnam and Srikakulam districts), the State is divided into 23 districts. The headquarters for R. R. district for the time being is Hyderbad City and for Vizianagaram district, Vizianagaram City.

Table 157

District	*Area (Sq. km)*	*Population (Provisional)*	*Head-quarters*
Andhra Region			
Anantapur*	19125	2545850	Anantapur
Chittoor*	15763	2729174	Chittoor
Cuddapah*	15356	1917736	Cuddapah
E. Godavari	10940	3700064	Kakinada
Guntur	11377	3451343	Guntur
Krishna	8734	3050485	Machilipatnam
Kurnool	18799	2382501	Kurnool
Nellore	13058	2004914	Nellore
Prakasam	17620	2302014	Ongole
Srikakulam	5837	1943749	Srikakulam
Visakhapatanam	11161	2563438	Visakhapatanam
Vizianagaram	6539	1802947	Vizianagaram
W. Godavari	7780	2865786	Eluru
Telengana Region			
Adilabad	16133	1626688	Adilabad
Hyderabad	217	2279387	Hyderabad
R. R.	7493	1567304	Hyderabad
Karimnagar	11824	2433399	Karimnagar
Khammam	15866	1739515	Khammam
Mahaboobnagar	18419	2456111	Mahaboobnagar
Medak	9685	1805404	Sangareddy
Nalgonda	14242	2264736	Nalgonda
Nizamabad	7969	1673375	Nizamabad
Warrangal	12875	2297699	Warrangal
Total		53403619	

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* Rayalaseema

Agriculture. A. P. has a widely diversified, farming base, with a rich variety of cash crops. It is surplus in foodgrains and can rightly claim to be the granary of the South. Agricultural sector accounts for around 50% of the State's income and provides livelihood to 70% of the State's population. The crops extensively cultivated in the State are paddy, jowar, bajra, ragi, maize, groundnut, chillies, tobacco, cotton, castor and sugarcane.

A. P. leads all other states in the production of tobacco with a virtual monopoly in Virginia tobacco. The production of tobacco in 1980-81 was 1.64 lakh tonnes and castor 0.26 lakh tonnes.

Irrigation. Irrigation has received top attention in the State. The total irrigation potential in 1980-81 is 103 lakh hectares and net area under irrigation is 34.6 lakh hectares.

Animal Husbandry. The livestock population in Andhra Pradesh during 1979 is as follows: Cattle 120.25 lakhs, buffaloes 71.59 lakhs and sheep 70.70 lakhs, making a total livestock of 314.43 lakhs. Every tenth litre of milk produced in India is obtained in Andhra Pradesh.

Forests. Forest area of the state extends over 6.44 m ha. or 23 per cent of the land area of the State. The main forest belts lie in the north, northeast and south. Dense forests are found in the districts of Srikakulam, Visakhapatanam, East Godavari, West Godavari and Kurnool. The important forest products are timber, firewood, charcoal, bamboos, beedi leaves and sandalwood.

The Government has adopted a three-pronged strategy to hasten forestry development. It has set up a separate Corporation, launched a programme of social forestry and has ordered the replacement of contractors by departmental machinery. Accordingly, the AP Forest Development Corporation, formed in June 1975, spearheads the responsibility for regeneration of forests.

The forest resources of Andhra are being exploited to the full. Apart from the 2 large-sized paper mills already working—Sirpur paper and AP paper—more paper and board units like Bhadrachalam Paper and Boards are fast coming up.

Fisheries. AP is the fifth largest state in India with a coastline of 982 km and a continental shelf covering an area of about 32,000 sq. km. Fishing harbours at Visakhapatanam, Kakinada and Nizampatanam are among the major fishery projects in operation. The predominant method of fishing is gill netting. Nearly 70% of the marine fish production is contributed by indigenous crafts. There are about 2,37,470 coastal fishermen distributed in 480 fishing villages. There is a Fisheries project at Tungabhadra dam, which is a joint venture of the AP and Karnataka State Governments. Production of inland fish amounted to 121,893 tonnes and marine fish 116,013 tonnes in 1980.

Minerals. AP has vast mineral resources. The mineral-based industries in the state are dominated by limestone. The mineral reserves in the state are as follows:

Asbestos	....	0.25 m. tonnes
Barytes	....	6.00 ,,
Coal	....	3000 ,,
Gold	....	0.21 ,,
Iron ore	....	390 ,,
Limestone	....	2018 ,,
Bauxite	....	30.0 ,,

Mica is another important mineral found in considerable quantities in Nellore district. It has abundant reserves of manganese ore in Srikakulam and Visakhapatanam districts. In 1981, the main mineral output was: Asbestos 1100 tonnes, barytes 340,700 tonnes, coal 9.8 metric tonnes.

Power. Thanks to the large coal reserves, water resources, the power potential of the State is very high. In 1981, the installed capacity was 2297.9 m.w. and power generated 7130.98 MKWh. The number of villages electrified was 17,509 and number of pumpsets energised 427,388.

Industry. AP which has for long been at the bottom of the industrial map of India today stands fifth in the country, in terms of industrial development, sixth in respect of employment, seventh in respect of output and eighth in respect of productive capital and value added. During 1978-79 there were 8836 registered factories. The first big steel plant with an investment of Rs. 3700 crores is coming up at Visakhapatanam.

Tourism. Andhra Pradesh is rich in historical monuments. It possesses many holy temples which attract large numbers of pilgrims and tourists.

Tirupati in Chittoor district houses one of the most famous temples in India. The presiding deity is known as Venkateswara. The main temple is situated on a hill-top, Tirumalai, and is a masterpiece of South Indian architecture.

The temple of Sriramachandra is at Bhadrachalam, the Mallikarjunaswami temple at Srisailam. The Ahobalam temple Srikurman temple and the Simhachalam temple are among the other famous temples of Andhra Pradesh. The main tourist attraction is the capital of the State, *Hyderabad*. The capital is in reality the twin cities of Hyderabad and Secunderabad linked together by the Hussain Sagar. Places of interest are the Char Minar built in 1591, Osmania University, State Museum and Art Gallery, Salarjung Museum, Health Museum and Public Gardens.

Another important centre of tourism is Golconda, about 5 miles from Hyderabad. The capital of the Qutub Shahi Sultans in the 16th century, Golconda is rich in historical monuments which include the famous Golconda Fort. Golconda was known the world over, as a rich mine of diamonds in the mediaeval times. The famous diamonds, *Kohinoor* and *Pitt*, came from the diamond mines of Golconda.

158. SEVEN SISTERS OF THE NORTH EAST

The north-eastern region of India comprises the States of Assam, Nagaland, Manipur, Meghalaya and Tripura and the Territories of Arunachal Pradesh and Mizoram. These States and Territories have latterly been dubbed the Seven Sisters.

Bounded by Tibet, Bhutan and China on the north, Burma on the east, and Bangladesh on the west, the north eastern region is linked to the rest of India by a small strip of land 56 metres across and remains characteristically different from India as a whole. Although this region is endowed with abundant natural resources in forests, minerals and hydro-power, its economy still remains primitive.

The Sisters have many things in common. They are all impoverished and remain striking examples of a dual economy—with a relatively better-off urban elite and a woefully poor rural majority. The glittering scenes presented by the towns have generally misguided others into believing that these Sisters are quite well-off. Actually their progress has been hamstrung by a number of factors—the slow and inadequate development of infrastructure, particularly transport, low population density, industrial backwardness and non-availability of modern technical skills among the local population. On top of it, no State or Territory in this region has a viable economy and is sadly dependent on central help for survival.

In 1972 the North Eastern Council was formed to co-ordinate the economies of these States and Territories and set them on the path of economic development. The Council failed in the attempt, since the States and Territories were pulling in different directions and were more occupied with internecine disputes than internal development.

The table shows the economic profile of the north-eastern States (Territories not included).

Table 158

Economic Profile of the NorthEastern Region

	Assam	*Manipur*	*Meghalaya*	*Nagaland*	*Tripura*	*All India*
Area ('000 sq. km)	79	22	22	17	10	3288
Population (million 1979)	19.2	1.4	1.3	0.7	2.0	646.8
Percentage of rural population	91.1	68.8	85.5	90.1	59.6	80.1
Density of population per sq. km	150.0	48.0	45.0	31.0	149.0	178.0
Backward districts as per cent of total for the state (Area)	77.4	100.0	100.0	100.0	100.0	71.3
(Population)	75.6	100.0	100.0	100.0	100.0	59.0
Percentage of Literacy	28.7	32.9	29.5	27.4	31.0	29.5
Percentage of Workers to total population	28.3	34.6	44.2	50.8	27.8	32.9

In 1979 the bickering Sisters (both States and Territories) seemed to come together on a common platform. All of them started a campaign against foreigners. Foreigners meant all those who were not natives. Every state had its own name for these foreigners. They were known as *bahirgat* in Assam, *udkar* in Meghalaya, *vai* in Mizoram and *mayang* in Manipur. Assam the eldest of the Sisters, led the way, by a state-wide agitation against outsiders with the slogan "Indians Go Back". In Sept. 1979 Assam demanded that the names of outsiders should be removed from the electoral rolls for the ensuing elections to the Lok Sabha. The outsiders were identified as all those who were not enumerated in the 1951 Census, that is, all those who were not in Assam in the second year of the Indian Republic. This was taking history back by thirty years—an obviously arduous if not impossible task. With three censuses 1961, 1971 and 1981 (1981 census though incomplete) gone by, it appeared too late to hark back to 1951.

But the agitators refused to comply. The electoral rolls were not revised and no elections took place in 12 constituencies because no candidate came forth to file nomination. Having presented such a united front, Assam went on to picket oil fields and installations, to keep away their children from schools and colleges and generally to indulge in activities that disrupted normal life.

The snag here is that no State or Territory has any citizenship of its own. Therefore, to ask for the deportation of outsiders from Assam is to ask for the deportation of the citizens of India from one of its States. Ridiculous as the demand looks, it is nothing more than a natural outgrowth of "the sons of the soil" doctrine proclaimed by politicians in other States. But in none of the other States has any overt action been taken against outsiders though covert discrimination against such is all too obvious.

In the north eastern states the problem has been compounded by the presence of lakhs of illegal immigrants who are foreigners in the true sense of the term. These are immigrants who have slipped into India surreptitiously after the partition and then again during the turmoil that resulted in the birth of Bangladesh. These immigrants have crowded out the indigenous population who are now struggling for recognition. It is the presence of such foreigners that has triggered the present movement against outsiders both in Assam and in her sister States.

The Assamese agitators do not really demand the expulsion of any bona fide Indian citizen and certainly not on the ground of language or religion. What they insist on is that foreigners in the proper sense of the term should be identified in the first instance as from 1951 to the present day and that proper steps should be initiated against them.

159. ASSAM

Scholars are not agreed on the origin of the name 'Assam'. Some say that Assam is called so, because of its unequal terrain -that is, hills interspersed with valleys. They rely on a similar-sounding Sanskrit word, meaning unequal. This explanation appears to be far-fetched. A more acceptable version is that Assam is only the anglicised version of 'Asom'—which was the name the Ahoms gave to the country, when they conquered it.

Geographically Assam is a shadow of its former self. It has been reduced to one-third of its original size in thirty years' time. In 1947 Assam had an area of over 2 lakh sq. km excluding the then North East Frontier Agency (NEFA), the present Arunachal Pradesh. Today the total area of Assam is only 78,523 sq. km. The depletion in geographical area resulted from political changes that came one after the other since 1947.

In the partition of India (1947) Assam lost Sylhet district, except a major portion of Karimjang sub-division, to East Pakistan, now Bangladesh. Out of the 27 lakh population of Sylhet, Assam retained only 7 lakhs. the rest going to Pakistan. Thereafter, Assam continued to lose territory and population step by step as Nagaland, Meghalaya, Mizoram and Arunachal Pradesh were separated from it.

Arunachal Pradesh, the former NEFA, was not technically a part of Assam but for all practical purposes it was regarded as part of Assam. It was expected that Arunachal would be merged in Assam to compensate for its loss of territory to Nagaland, Meghalaya and Mizoram.. But it was not done.

The loss of population was not of much account. It was soon made up by the influx of refugees from East Pakistan and the growth of the population in Assam itself. The loss in area, however, was permanent and crippling. The territorial sorrows of Assam do not seem to have ended. The boundary line between Assam and Nagaland is still unsettled. And Nagaland is claiming more territory. Meghalaya too is making territorial demands against Assam in the strategic area near Dispur, Assam's new capital. The Union Territories of Mizoram and Arunachal Pradesh are also claiming slices of territory along their frontiers.

Physiography. Assam, as it is today, may be divided into two important physical regions—the Assam Himalayas and the Brahmaputra Valley.

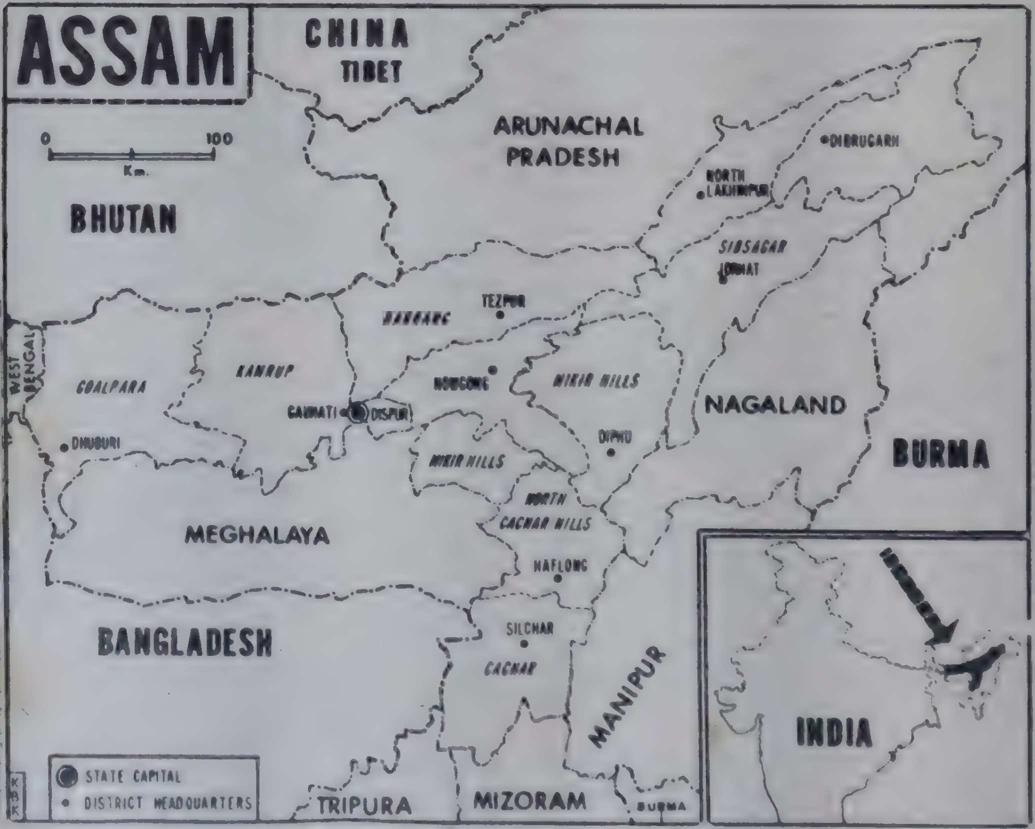
The Assam Himalayas represents the easternmost section of the great Himalayan range extending from the river Teesta in Sikkim over a length of 720 km across the Brahmaputra towards China. The highest peak of Assam, *Namcha Burwa* (7756 metres) is in the Mishmi Hills, in this region. *The Brahmaputra Valley* or the Assam valley is made up of two parts, the lower Assam valley where the plains are broken by isolated groups of hills and upper Assam valley, where unbroken plains lie from the Himalayas on the north-west to the Naga hills on the south-east. *The Shillong Plateau* is a range of mountains in the centre of Assam and divides the Brahmaputra valley from the Barak valley. The plateau, on the southern side, is remarkably abrupt and faces the Barak valley while the northern edge slopes gradually to the Brahmaputra valley. *The Barak Valley* consists mainly of swampy flats broken by numerous low isolated hills and ridges. The *south-eastern hilly region* includes the Naga, Mizo and Manipur hills. With the exception of Manipur plains, there is little flat ground in this region.

Rivers. Assam is dominated by the Brahmaputra river. The total length of the river from the source to the sea is 2900 km. Its drainage area is roughly 935,500 sq. km. It has 120 tributaries. After travelling 1609 km through Tibet, the river turns southeast making a hair-pin bend at a place, a few miles east of Namcha Burwa. Thereafter it is joined by tributaries. After crossing the Garo Hills, it makes a southerly turn and meets the Ganga at Goalundo. During the course of its flow in Assam for about 725 km, through almost every district, the river has carved out an extensive valley of its own.

Rainfall in Assam is one of the highest in the world. It varies between 178 and 305 cm. All this rainfall is concentrated in 4 months, June to September. This concentration of rainfall affects the State in two diametrically opposite ways, namely floods and droughts.

Floods and Droughts. Floods in Assam very often come in a series, one after the other. They cause widespread destruction and loss of life. 1972 & '73 were years of peak floods. In 1973, two successive waves of floods raged over Assam. 1978 broke all records. Floods continued to come one after the other from early June till the end of November.

Drought is more widespread and lasting than floods. As the rains cease suddenly drought sets in. It is instantaneous and devastating and the government and the people look on helplessly. There are no arrangements to collect and store the surplus water stock for future use. Consequently crops are affected just as much by drought as by floods, although less spectacularly.



The boundary of Meghalaya shown on this map is as interpreted from the North Eastern Areas (Reorganisation) Act 1971 but has yet to be verified.

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

Based upon Survey of India map with the permission of the Surveyor General of India.
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Earthquakes, like floods, are a common phenomenon in Assam. They may occur several times a year but ordinarily they do not do much damage. But now and then these earthquakes assume disastrous proportions. Of all these earthquakes, those of 1897 and 1950 have been the deadliest. The 1897 earthquake covered an area of 200 miles in length and 50 miles in width in the Shillong plateau. The 1950 earthquake was worse and is considered to be one of the five greatest earthquakes in recorded history. It carried destruction over an area of about 15,000 sq. miles. This earthquake brought about drastic changes in the configuration and drainage of the State, so much so that floods which have occurred since have become the greatest destroyers of man and property in Assam.

The People. An ideal meeting ground for diverse races, Assam gave shelter to streams of human waves carrying with them distinct cultures and trends of civilisation. Austro-Asiatics, Negritos, Dravidians, Alpines, Indo-Mongoloids, Tibeto-Burmese and Aryans penetrated into Assam through different routes and contributed in their own way towards the unique fusion of a new community which came to be known in later history as the Assamese. Assam, however, remained predominantly a land of the Tibeto-Burmese. The vast section of the people of Assam belong either to this stock or owe their origin to the fusion of this stock with other racial groups.

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Change of Guards in Assam

Administrative troubles descended in Assam from Aug. 1979, when the ruling Janata Party was reduced to a minority. The leader of the party and the Chief Minister of the State, Golap Borbora resigned. A new ministry, headed by J. N. Hazarika of the Assam Janata Dal, assumed office on 9th Sept. 1979. Some of the parties who supported Hazarika, withdrew their support. Hazarika, having thus lost the majority, resigned on 8th Dec. 1979. Towards the close of 1980 (Dec. 7), Mrs. Syeda Anwar Taimur took over as the Chief Minister.

On June 28, 1981, Mrs. Taimur, having lost majority support, resigned. On the 30th of June, Presidential rule was again imposed on Assam.

Administration. The Legislature consists of only one house—the Legislative Assembly. The State is divided into 10 districts.

Table 159

District	*Area (sq. km.)*	*Population* (in hundred)*	*Headquarters*
Cachar	6962	23772	Silchar
Darrang	8775	24076	Tezpur
Goalpara	10359	30851	Dhubri
Kamrup	9863	39593	Gauhati
Karbi Anglons	10332	5253	Diphu
North Cachar Hills	4890	1055	Haflong
Nowgong	5561	23306	Nowgong
Sibsagar	8989	25476	Jorhat
Lakhimpur	5646†	9878	North Lakhimpur
Dibrugarh	7024†	19573	Dibrugarh

* Mid—1980-81 projected.

† As per Village records.

History. Assam, known in ancient lore as Kamarupa, originally included in addition to modern Assam, parts of modern Bengal and Bangladesh. Gauhati, the pulsating centre of Assam, is an ancient town whose history goes back to the Puranic days. The city, anciently known as Pragjyotishpur, was said to have been founded by King Narakasur, who is mentioned in the Puranas and epics. His son Bhagadatta led a large elephant force to the battlefield of Kurukshetra, and fell fighting on the side of the Kauravas.

The origin of the name Kamarupa is variously explained. Some historians say that the name has been derived from some Austric words signifying the practice of a distinct cult of worship. The generally accepted version is that the name is associated with the re-birth of *Kamadeva,* the Cupid of Indian mythology. The story goes that *Indra* the chief of *Devaloka* sent Kamadeva to disturb Lord Siva in his meditations. Siva felt annoyed by Kamadeva and, opening his third eye, burnt Kamadeva to ashes. Rati, the wife of Kamadeva, entreated Lord Siva to restore her husband to life. Siva, taking compassion on Rati, brought back Kamadeva to life. The place where Kamadeva got back his form (roopa) and life came to be called Kamarupa. According to some historians, this story may signify the emergence of a new culture in this region after the penetration of the Aryans and their assimilation into the local currents of culture.

In the 13th century, the country was conquered by the Ahoms under the leadership of Sukapha, a prince of the Shan tribe, in the Upper Irravaddy Valley.

The advent of the Ahoms changed the course of Assam's history. Ahoms fought the local Kachari, Chutice and Moran kings and established their sway in course of time, over the whole Brahmaputra Valley.

The Ahoms appointed Bharphakans (Viceroys) to rule Kamarupa, and Gauhati became the capital of these Viceroys. The last of the Viceroys was Badanchandra, who in an ill-advised bid for power invited the Burmese to help him. The Burmese dislodged the Ahoms and dismissed their Viceroy, Badanchandra. The Ahoms appealed to the British for help.

The British defeated the Burmese in several battles, in what has since been called the First Burmese War. With the Treaty of Yandabo in 1826, the Burmese vacated Assam, leaving the British in possession. The conquered territory was placed under the administration of an Agent to the Governor General. In 1832 Cachar was annexed to Assam. In 1835, the Jaintia Hills were made part of Assam. Upper Assam was annexed to Bengal in 1839. In 1874 a separate province of Assam under a Chief Commissioner was created, with Shillong as capital.

On the partition of Bengal in 1905, Assam was united to the eastern districts of Bengal under a Lt. Governor. From 1912 the Chief Commissionership of Assam was revived, and in 1921 a governorship was created. In spite of the glory of the past and her spectacular progress under enlightened monarchies like the Ahom and the Koch, Assam witnessed days of misery and privation following the occupation of this area by British imperialists. The alien rulers scarcely paid heed to the needs of development of this region, as a result of which the economy of the State (province as it was known at that time) started showing signs of stagnation and decay. The twelve decades of foreign rule over Assam reduced her people to abysmal poverty.

On the Partition of India almost the whole of the predominantly Muslim district of Sylhet was merged with East Bengal (present Bangladesh). Dewanagiri in North Kamarupa was ceded to Bhutan in 1951.

Assam lost a good deal of its former territory, as a result of political changes, from time to time.

In 1948, the North East Frontier Agency was separated from Assam, for security reasons. In 1963, Nagaland was carved out of Assam as a full-fledged State. On 21st Jan. 1972, Meghalaya was cut out of Assam, as a separate State and Mizoram became a Union Territory.

The advent of freedom, however, released an enormous mass of energy and aroused people's enthusiasm which had been reflected in the perceptible development obtaining at present in different spheres of the State's socio-economic life.

Agriculture. The economy of Assam is predominantly agrarian. More than 70 per cent of the population of the State derive their livelihood mainly from this sector.

Among the crops, rice predominates covering more than two-thirds of the total cropped area.

Among the non-food crops, tea and jute occupy a pivotal position in the State's economy. The other important non-food crops grown in the State are mesta, tobacco, rape and mustard.

The total foodgrains production of Assam during 1980-81 was 27.06 lakh tonnes. Main cash crops are jute, tea, cotton, oilseeds, sugarcane, fruits and potatoes.

Agricultural Census. According to the Agricultural Census 1976-77 there were 22.5 lakh operational holdings in the state of which 22.0 lakh holdings were in the plains districts and 50 thousand in the hill districts, the corresponding figures in 1970-71 census being 19.6 lakhs for the State as a whole, 19.2 lakhs for the plains districts and 44 thousand for hill districts. The average size of operational holdings in the State declined to 1.37 hectares in 1976-77 from 1.47 hectares in 1970-71.

Irrigation. The problem of irrigation in Assam is twofold, too much water and too little water or, in other words, floods and droughts. Frequent and widespread floods and extensive water logging have become an inevitable and regular phenomenon in Assam. The great earthquake of 1950 caused extensive landslides and silting up and changes in river beds in the plains. Since then, the rivers have plagued the people of Assam with regular floods causing extensive damage to the economy.

The droughts that follow the cessation of rains are often intense and widespread. These cannot be tackled except by proper irrigation arrangements. Irrigation facilities in the State are very limited.

The irrigation potential created under State irrigation sector at the end of 1979-80 is 3.49 lakh hectares, During the year 1980-81 there is a target of bringing an additional area of 50.8 thousand hectares in general area and 1.3 thousand hectares in hill area in the State plan.

Assam forests provide enough raw materials to feed gigantic industries but their exploitation is limited. During 1979 the State had 52 plywood factories, 395 sawmills and 2 paper mills. Two more paper mills are planned.

Tea Industry. Tea cultivation in Assam started as early as 1835 near the confluence of the Brahmaputra and the Kundil rivers under the initiative of the British Government. C. Bruce, brother of R. Bruce, the discoverer of tea in 1823, was appointed Superintendent of the Government Tea Forests.

The Assam Tea Company took charge of the government plantation in 1840, and this can be regarded as the real start of tea cultivation in Assam.

Tea plays a pivotal role in the economy of Assam. Assam tea accounts for about 53 per cent of the country's total production. It provides direct employment to about 4.5 lakh persons. During 1980 Assam produced 305 million kg of tea as against 575 million kg for the country as a whole.

Commissioning of the Tea Auction Centre at Gauhati in September 1970 formed the first step in the development of tea marketing in the State. From a total of 22 million kg tea sold in 1971-72 the sales increased to 64.97 million kg in 1981.

Power. Assam has the largest power potential in India based on water, natural gas, coal and oil. The hydro-electric power potential of Assam is estimated at 12million kw which is nearly one-third of India's total hydel potential.

Power production in the State has been fluctuating. In 1970-71, Assam produced a total of 359.5 million kwh, out of which hydel schemes accounted for 154.1 million kwh. In 1978-79 total power production rose to 658.5 million kwh but fell to 513 million kwh in 1979-80.

The installed capacity of power in Assam (1981-82) is 312.5 MW. This capacity will be increased by 583 MW by the end of the current sixth five-year plan in 1983-84. New power projects are under construction at Lakwa and Bongaigaon. The total generation of power during 1981-82 is 728.05 million Kwh.

Rural Electrification. Upto March 1982 a total of 6673 villages were electrified. The ratio of villages electrified to total villages is 30.33 per cent.

Animal Husbandry. Cattle are the most important category of livestock in the State. The 1972 livestock census revealed that cattle population accounted for about 72 per cent of the total livestock population (excluding poultry) of the State. According to estimates the production of milk in 1976-77 was 343 million litres as against 338 million litres in 1975-76 and egg in 1976-77 was 207 million as against 192 million in 1971-72.

Table 160

Cattle Population in Assam in 1969

	lakhs
Total No. of cattle	66.04
Total Working Cattle (male)	22.74
Cows in milk	11.90
Cattle per 1000 human population	345

Sericulture and Weaving. Sericulture and weaving play an important role in Assam, particularly in the rural areas. Every Assamese household in the rural areas of the State is directly or indirectly connected with handloom weaving. *Eri*, *Muga* and *Tassar* are the important varieties of silk in the State.

The Govt. of Assam in collaboration with the Central Silk Board have taken up schemes for the rapid development of the industry of the State.

A massive development plan programme has been drawn up with an outlay of Rs. 1834.46 lakhs. It will provide employment to 30,200 families in the State by 1982-83.

An export-oriented handloom project with an outlay of Rs. 39.73 lakhs has been started in Sualkuchi area to exploit the export potentialities of *eri* and *muga*.

Forests There are 1.62 m hectares of reserved forests under the administration of the forest department and 1,229,000 hectares of unclassified forest. Altogether about 30 per cent of the total area of the State is under forests.

All types of forests are represented in Assam; evergreen forests, mixed deciduous forests, deciduous and dry deciduous forests, riverine forests, savannah forests, swamp forests and temperate forests containing sal, teak, hollock, holong, bansam, amari, gamari, ajbar, sissoo, simul, cane, bamboos, reeds and various species of medicinal importance.

The two hill districts of the State account for 37.3 per cent of the State area under forest. About 88 thousand hectares of forest area has been utilised for the wild life sanctuaries (see Wild Life-infra).

Minerals. Assam is very rich in mineral resources. The minerals occurring in the State are petroleum, natural gas, coal, limestone and clay. In view of the recent oil crisis all over the world, the importance of Assam as an oil producing State has gained further importance.

The important minerals being exploited currently are petroleum, natural gas, coal and limestone. Assam produces about 50 per cent of the country's total petroleum output and natural gas (1979).

The details of production of various minerals in Assam during 1981 are: Crude oil 4386 lakh tonnes, natural gas (utilised) 869 million cubic metres, coal 651,000 tonnes, and limestone 269,000 tonnes.

Industries. Assam is very rich in industrial raw materials, but much of the wealth remains unutilised. The industrial development of this State is mainly handicapped by her isolation from the rest of India, a bad transport system and a very small local market.

Though the number of registered factories in the State is increasing, the pace is slow and way behind the country as a whole. The number of factories upto 1980 is only 1897.

Education. The progress of literacy in Assam has been very poor, from 27 per cent in 1961 to 28.1 per cent in 1971, as against the national average of 24 per cent in 1961 and 29 per cent in 1971.

Table 161

Educational Institutions as in 1978-79

Universities	3
Colleges for General Education, Arts & Science, Commerce & Sanskrit	139
Schools for general education from Pre-primary to Higher Secondary	27313
Institutions for professional education (undergraduate level)	19
Teachers Trg. Institutions	38
Schools for vocational/professional/special and other education	473

The Government of Assam has declared education free in the State up to X standard since April 1978. Stress has been laid on the implementation of the national Adult Education Programme in the State and under this programme, 25 lakhs of illiterate persons would be made literate in the State by 1983-84.

Tourism. The main tourist attraction in the State is its wild life. The State possesses one of the richest fauna in Asia. It is claimed that outside Africa, there is no area in the world with so many varieties of animals, birds, reptiles and insects. Rhinoceroses, elephants, wild buffaloes, bisons and mithuns, swamp deer, sambar, spotted deer, barking deer, tiger, leopard, black panther, king cobra, pink-headed duck and the giant hornbill are some of the well-known specimens of wild life in the State.

160. BIHAR

The name 'Bihar' is a corrupt form of 'Vihara' which means a Buddhist monastery. Bihar, squeezed in between West Bengal, Orissa, MP and UP, reaches up to the Himalayas in the north and is completely land-locked. Bihar is bounded on the north by Nepal, on the south by Orissa, on the east by W. Bengal and on the west by MP and UP.

Physiography. Stretching from the Himalayan foothills in the north to Orissa in the south, Bihar suffers all the vicissitudes of changing seasons. It gets the worst of the cold and the worst of the heat and plenty of floods into the bargain.

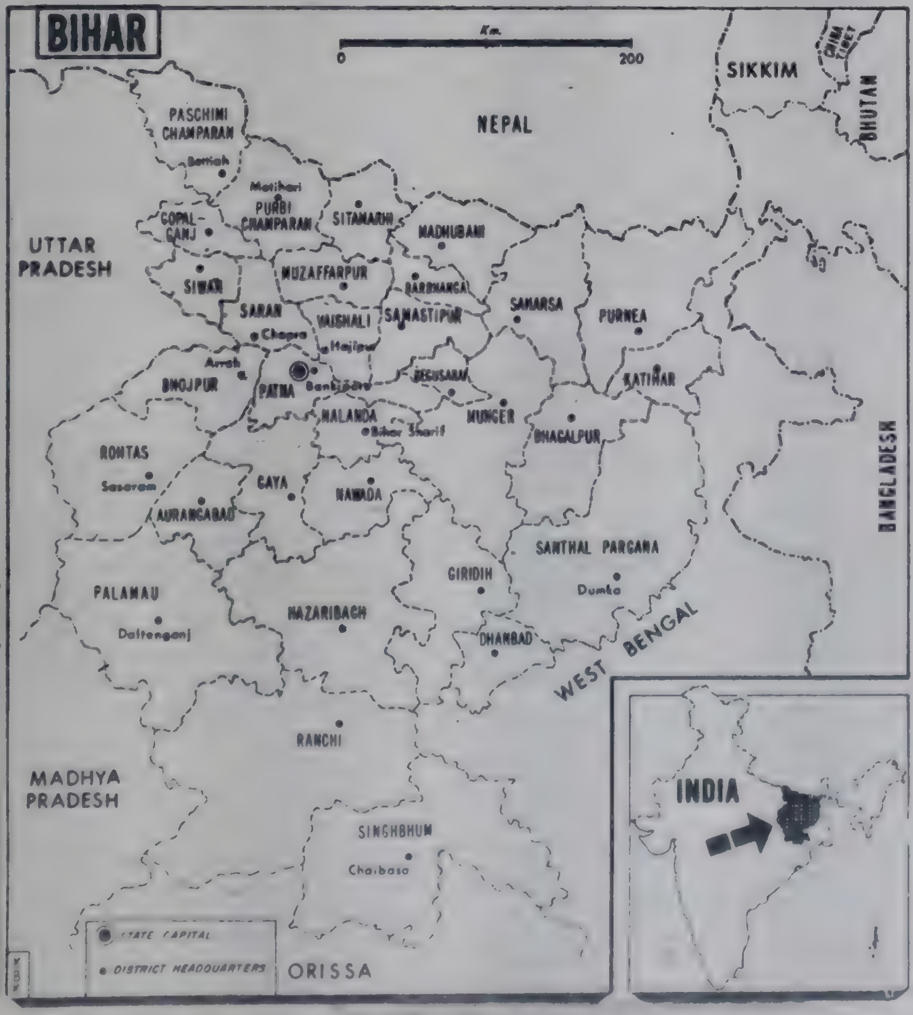
The year 1975 was typical. In January 1975 a cold wave struck Bihar killing 250 persons. In May the sun took over. Sunstroke deaths numbered about 40. A terrific drought set in. Drinking water ran critically short. Hazaribagh on the 10th of May recorded 42 degrees C, the highest temperature recorded in 20 years. In July, it was the turn of the floods. Bihar along with Assam bore the brunt of the first flood. It isolated thousands of villages and towns in Bihar, inundated all low lying areas, demolished houses, destroyed paddy and jute crops, disrupted all communications and crippled life. Towards the end of August, Bagmati, Bakeya, Burhi, Gandak and Kosi (Bihar's river of sorrow) all started swelling together. Flood waters breached bunds and entered Patna, the capital. They inundtaed the Raj Bhavan.

The most striking geographical feature of Bihar is the sharp division between north and south. The northern portion is almost entirely a level tract, while the southern region is wooded and hilly. North Bihar is an extremely fertile strip of land, being watered by the rivers Sarayu, Gandak and Ganga. Southern Bihar, especially in and around the districts of Chota Nagpur and Santhal Parganas, is thickly wooded and consists of a succession of hills. The elevation varies from 300 to 1300 m., the highest peak being 1372 m.

History. Bihar has a very ancient and colourful history. Known in ancient days as Magadha, Bihar was the home state of the Mauryan emperors. Under Asoka the Great, Magadha and its capital Pataliputra became famous all over the world. With the death of Asoka, its fortunes declined. However, under the Gupta emperors it regained its lost glories. Under the Sultans of Delhi, and later under the Moghul emperors, Bihar was reduced to the status of a province, whose only importance was that it lay on the route from Bengal to Delhi.

When Sher Shah, a Behari himself, drove out Humayun and occupied the throne of Delhi, Bihar once again shot into limelight. Sher Shah founded the city of Patna, on the site of the ancient capital Pataliputra and gave the country an efficient administration. Bihar enjoyed a period of peace and stability under Akbar the Great and later Moghuls. With the decline of the Moghul empire, Bihar passed into the hands of the Nawabs of Bengal. The British wrested the country from the Nawab of Bengal, by the decisive battle at Buxar in Bihar (1764). Under the British Bihar was first a part of the Bengal Presidency. In 1911, Bihar, along with Orissa, was separated from the Presidency of Bengal. In 1936, Bihar and Orissa became separate provinces.

Administration. Bihar is one of the medium-sized states of India being the ninth in area. But in population it is the second biggest State in India, next only to Uttar Pradesh. In 1981 it had a population



Based upon Survey of India map with the [illegible]
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of over 69 million. In minerals, Bihar is the richest State in India, accounting for nearly 40 per cent of the total mineral production of India.

Legislature. The Legislature consists of two houses—the Legislative Assembly and the Legislative Council.

The State is divided into 4 Divisions and 31 Districts.

Table 162
Area and Population Districtwise

District	*Area (Sq.km)*	*Population* (1981 census)*	*Head-quarters*
Patna	3181.9	3031463	Patna
Nalanda	2346.1	1638364	Biharsharif
Gaya	4287.1	3138316	Gaya
Aurangabad	4408.9	1236528	Aurangabad
Nawada	3647.6	1099067	Nawada
Bhojpur	4023.8	2389658	Arrah
Rohtas	7296.2	2363905	Sasaram
Saran		2074267	Chapra
Siwan	6952.0	1778050	Siwan
Gopalganj		1361555	Gopalganj
Champaran East	4333.8	2427749	Motihari
Champaran West	4862.2	1967579	Bettiah
Muzaffarpur	3160.1	2353283	Muzaffarpur
Vaishali	2018.7	1661512	Hajipur
Sitamarhi	2659.2	1929827	Sitamarhi
Dharbhanga	2296.0	2004583	Dharbhanga
Samastipur	2856.4	2116741	Samastipur
Madhubani	3526.6	2324074	Madhubani
Monghyr	7927.6	3314806	Munger
Bhagalpur	5656.0	2610719	Bhagalpur
Santhal Parganas	14129.0	3707160	Dumka
Begusarai	1899.4	1456512	Begusarai
Saharsa	5885.0	2952234	Saharsa
Purnea	7989.7	3592637	Purnia
Katihar	3023.3	1427197	Katihar
Palamau	12677.0	1916152	Daltonganj
Hazaribagh	11152.5	2195735	Hazarebag
Giridih	6907.5	1730478	Giridih
Ranchi	18331.0	3059362	Ranchi
Dhanbad	2994.0	2104381	Dhanbad
Singhbhum	13447.0	2859260	Chaibasa

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* Provisional

Agriculture. Bihar is ideally suited for agriculture. It has a favourable climate, large tracts of fertile alluvial soil coupled with largely unexploited surface and ground water potential. But unfortunately this State ranks among the most undeveloped and backward States of India. This is mainly due to defective land tenure systems resulting in highly skewed land distribution and leading to low agricultural productivity

However, the present government is determined to help to increase agricultural productivity and has adopted several measures to aid and encourage farmers to increase their total productivity.

Irrigation. The total area under irrigation in 1971–72 was 2788 thousand hectares, the major portion being covered by rice. The major irrigation projects are on the rivers Kosi, Gandak, Badua Chandan, North Koel and Bagmati. There are a number of small and medium irrigation projects to benefit tribal areas. Several flood control schemes are in various stages of construction.

Special attention is paid to minor irrigation. Out of the World Bank loan of Rs. 40 crores the State had spent till June 1977, 18 crores in providing tube wells and pump sets for farmers.

Animal Husbandry. The livestock population of the State has been steadily decreasing from 30.6 million in 1961 to 27.9 million in 1972 but poultry has shown a slight increase from 12.2 million in 1961 to 12.5 million in 1972.

The main objectives of the government in the field of animal husbandry are to improve the production potential of the local livestock and poultry by providing facilities for scientific breeding, nutritive feed and fodder and disease control measures. Each of these objectives is being pursued so as to result in an all round progress in production.

Forests cover about 19 per cent of the total land area. The total area of reserved, protected and unclassed forests in Bihar is 11883 sq. miles.

The main forest products are timber, bamboos, kendu leaves (for making beedis), gums, resins and lac.

Lac is the principal natural produce of Bihar. Bihar, in fact, holds a sort of monopoly in lac production. It produces nearly 60 per cent of the total Indian production.

Afforestation of nearly 6000 hectares grassland was to have been completed by

1978. Exploitation of forest wealth has been improved by new projects like the collection of sal seeds. In 1977 over 15000 metric tonnes of sal seeds were collected by the Forest Dept. Bihar State Forest Development Corporation has worked out schemes to collect other valuable seeds like those of Mahua, Karanj and Kusum. The revenue of the forest dept. has increased from Rs. 7.84 crores to Rs. 16.66 crores between 1973 and 1978.

Minerals. Bihar excels not only in the wide range of mineral wealth that it possesses but also in the production of various vital minerals.

Bihar accounts for 48 per cent of the country's coal, 48 per cent of bauxite, 45 per cent of mica, 100 per cent of kyanite and 90 per cent of apatite.

Other minerals having significant production in Bihar are manganese, limestone, graphite, chromite, felspar, columbite, saltpetre, glass sands, slate lead, mica, silver, building stones and radioactive minerals.

Power is in short supply in Bihar. Major power projects are the Patratu thermal power station and Subarnarekha hydro-electric-cum-irrigation project. While Barauni thermal power station is under Bihar State Electricity Board, Bokaro and Chandrapur thermal power stations and Tilaiya, Maithon and Panchet hydel power stations are under the Damodar Valley Corporation.

The total output of power at present is only 300 MW. The State has requested the Central Government for sanction to erect thermal stations so as to improve power supply.

Industries. The Government of India has set up in Bihar a large number of giant undertakings such as Bokaro Steel, Barauni Refinery, Fertiliser Factory and Heavy Engineering Corporation. Jamshedpur, India's "Steel town", is also located in Bihar.

Strangely enough, these gigantic industries haven't improved the economic conditions in the State.

The State Government is at present considering the establishment of several new industrial units, so as to give a boost to the economy of the State. The Mica Syndicate, sponsored by the State Government, is already functioning.

There are 28 sugar factories, seven cement factories, seven distilleries, three jute mills and one wagon building unit.

Among cottage industries, silk and handicrafts occupy the leading position. A spun silk mill in the public sector has been set up in Bhagalpur.

Education. Bihar is far behind in literacy with 26.01 per cent literates in 1981 and ranked 27th among the States and Territories of India.

The state government is doing all it can to spread literacy and education. All children in the 6-11 age group are given free and compulsory education.

Health Facilities. The State had very poor health facilities. The present government is set upon improving them at any cost. The government has a minimum programme of a hospital at every Community Block Centre and a health subcentre for every 10,000 population. More than 5000 health centres and some 4500 subcentres have already been set up.

Antiyodaya Programme. This is a new approach to the problem of poverty and unemployment. Under this programme 30 villages are to be selected from every Community Block. As a start 5 of the poorest families will be selected who will be given financial help to take up any vocation according to their inclination. As soon as these families are on the way to rehabilitation, other families would be brought into the scheme. This programme is now part of the Integrated Rural Development Programme (IRDP).

Tourism. Places of tourist interest are Buddha Gaya, Jamshedpur, Nalanda, Patna, Ranchi and Sasaram.

Buddha Gaya, near Gaya in Bihar, is a Buddhist centre of pilgrimage. It contains the famous mediaeval temple near the Bodhi Tree under which the Buddha is reputed to have received enlightenment.

Jamshedpur is India's steel town.

Nalanda was one of the great seats of learning in ancient India and contains the ruins of many Buddhist temples and monasteries.

Patna, capital of Bihar, stands on the site of the ancient city of Pataliputra.

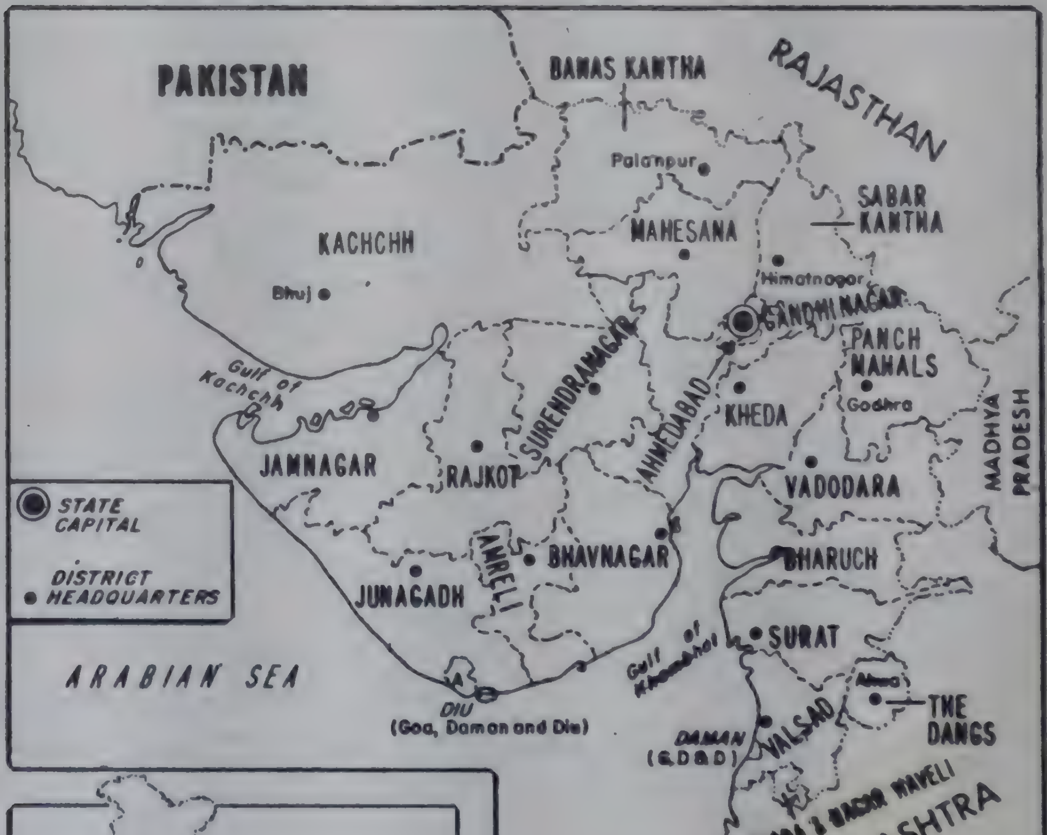
Sasaram is famous on account of the magnificent tomb of Sher Shah, Emperor of Delhi.

Hazaribagh National Park is a wild life sanctuary.

161. GUJARAT

Gujarat, lying in the north west corner of India. is the seventh biggest State in point of area and the tenth in point of population (1981). It is bounded on the north-west by Pakistan, on the north by Rajasthan, on the east by MP and on the south and south east by Maharashtra.

Physiography. The State of Gujarat occupies the northern extremity of the western seaboard of India. The state comprises three geographical regions: (1) The peninsula, traditionally known as Saurashtra, juts out into the sea like an ugly head. It is essentially a hilly tract sprinkled by low mountains. (2) Kutch on the north east is barren and rocky and contains the famous Ranns (desert) of Kutch, the big Rann in the north and the little



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

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Rann in the east. (3) The mainland extending from the Rann of Kutch and the Aravalli Hills to the river Damanganga is on the whole a level plain of alluvial soil. The plains of Gujarat are watered by big rivers like Sabarmati, Mahi, Narmada and Tapti and by smaller rivers like Banas, Saraswathi and Damanganga. The rainfall in the state, except in the arid zones of Surendranagar and north Gujarat, varies between 65 and 127 cm. As the Tropic of Cancer passes through the northern border of Gujarat, the State has an intensely hot or cold climate. But the Arabian Sea and the Gulf of Cambay in the west and the forest-covered hills in the east soften the rigours of climatic extremes.

History. The early history of Gujarat is lost in antiquity and is intermingled with myths and legends. In historical times, we find Gujarat as a part of the great empires of India—the Mauryan, the Gupta and the lesser empires of later times. The The foundations of modern Gujarat were laid in the 10th century by Mulraj Solanki, a ruler of the Chalukyan dynasty. By the end of the 13th century, Gujarat passed under Muslim rule. As a result, Gujarat evolved a happy synthesis of Hindu and Muslim cultures.

Administration. The Legislature has only one house, the Legislative Assembly, consisting of 182 members.

The State is divided into 19 districts.

Table 163

Area, Population and Headquarters of Districts

District	*Area in (sq. km)*	*Population 1981 Census**	*Headquarters*
Ahmedabad	8707	3840472	Ahmedabad
Amreli	6760	1075766	Amreli
Banaskantha	12703	1665511	Palanpur
Bharuch	9038	1295544	Bharuch
Bhavnagar	11155	1876471	Bhavnagar
Gandhinagar	649	287483	Gandhinagar
Jamnagar	14125	1390125	Jamnagar
Junagadh	10607	2098660	Junagadh
Kheda	7194	3007194	Kheda
Kachchh	45652	1049589	Bhuj
Mahesana	9027	2544616	Mahesana
Panchamahals	8866	2313589	Godhra
Rajkot	11203	2058136	Rajkot
Sabarkantha	7390	1498056	Himatnagar
Surat	7657	2491084	Surat
Surendranagar	10489	1033423	Surendranagar
The Dangs	1764	113996	Ahwa
Vadodara	7794	2550196	Vadodara
Valsad	5244	1770994	Valsad

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* Provisional.

Food Crops Bajra is the most important food crop in the state and forms one-third of the total production in the state and about one-fourth of the country's total output.

Wheat, the next most important crop, constitutes about one-fifth of the state's total production of foodgrains.

Rice forms about 14 per cent of the foodgrain production. Of this, Bulsar district alone produces one-fourth.

Jowar comprises about 12 per cent of the foodgrain production in the state and maize about 8 per cent.

Commercial Crops. Gujarat accounts for about 20 per cent of the total area under cotton in India and about 35 per cent of the total production in the country. Also it produces some of the finest varieties of cotton in India. Baroda district alone contributes 18 per cent of the State production.

Gujarat has nearly one-fourth of the total area under groundnuts in the country and produces about 30 per cant of the country's total output. Junagadh district leads in the production of groundnuts in the state, accounting for about 2 per cent of the state production.

About 15 per cent of the country's tobacco is produced in Gujarat. Within the state, Kaira district leads with about 70 per cent of the state production.

Table 164

Area & Production of Principal Crops

(Based on Final Forecasts) (1980-81)

Crop	*Area ('000 Hectares)*	*Production ('000 Tonnes)*
Rice	478	557
Wheat	656	1298
Jowar	906	583
Bajra	1380	1222
Total Foodgrains	4473	4475
Cotton	1572	1714†
Groundnut	2125	1645

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† In '000 bales of 170 kg each.

Forests. The total area of forests under the control of the Forest Department is 19,589 sq. km or about 10 per cent of the total land area. This is far below the optimum level of 33 per cent laid down in the National Forest Policy. Owing to the wide variations in climate and topography, forests in Gujarat cover a wide range from pure scrub forests in Kutch to big deciduous forests in Dangs.

Table 165
Forests

Item	Area in sq. km 1979-80	 1980-81
Total area under forests	19535	19655

Animal Husbandry. Gujarat ranks high among the States of India in livestock industry. It has two high milk-yield varieties of cows—Gir and Kankrej. There are 5 cattle-breeding farms in the State.

There are 3 farms for sheep-breeding at Patan and Morvi. One horse-breeding farm for Kathi-breed of horses is run at Junagadh and a camel-breeding station at Dhori in Kutch district.

Table 166
Livestock

Item	1972	1977
Total Cattle (In '000)	6457	6006
Total Buffalo (In '000)	3468	3473

Fisheries. One of nature's gifts to Gujarat is its long coastline extending over 1600 km broken up by several bays, inlets, estuaries and marshlands. The State has a span of over 12,000 sq. km of ocean area spread over through inshore, offshore, and midwater regions available for fishing. Some of the richest fishing grounds in India are located off Gujarat State and most important species like pomfret, Indian salmon, hilsa, jewfish., prawn, perch, Bomby duck and tuna are found in large quantities in these waters.

The Gulf of Kutch also presents excellent conditions for the growth and sustenance of pearl-oysters, windowpane oysters, chanks, other shell-fishes, turtles, sea-weeds etc. Similarly about 35.200 km of rivers and canals and 500,000 hectares of lakes, reservoirs, tanks, estuaries and brackish water swamps form a rich, potential source of inland fisheries.

The Halar-Okha coast of the State is famous for its shell and chank fisheries. Chank fishery is conducted departmentally. Between 12,000 and 16,000 kg chanks are collected annually and auctioned.

Power. There has been a more than 15-fold increase in the installed capacity in the State from 142 MW in 1951 to 2216 MW in 1978-79.

Table 167
Power

Item	Unit	1979-80*	1980-81*
Installed Capacity	MW	2212	2197
Generation	Lakh KWH	88520	93633
Consumption	Lakh KWH	73060	75723

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* Provisional

Minerals. Gujarat is rich in minerals like salt, limestone, manganese, gypsum, china clay, calcite, bauxite, etc. Kaira is rich in bauxite and limestone, while calcite and limestone are mined in Jamnagar. Manganese is mined in Baroda and Panchmahals, while fireclay is mined in Surendranagar district. Gypsum is available in all the districts of Saurashtra. The Geological Survey of India has located flourspar deposits in the Amba Dongar area of Baroda district.

Industry. The major industries of the State are textiles (including ginning and pressing of cotton), general and electrical engineering, vegetable oils, and chemicals (including salt, soda ash and cement). Ahmedabad, Surat, Jamnagar, Bhavnagar and Rajkot are the main centres of industrial development in the State and together account for 45.47 per cent of the total working factories and 56.38 per cent of the total workers employed.

The discovery of oil and gas fields has thrown open a number of new avenues. The Koyali Refinery and a fertiliser complex near Baroda has added a new dimension to the industrial economy of Gujarat. A petrochemical complex near Baroda is the next phase of the development of oil-based industries in Gujarat. The chemical industry in the State has made very rapid progress in the past ten years. The State holds a virtual monopoly of an important chemical like soda ash. It is also an important producer of such basic chemicals as sulphuric acid and caustic soda.

Table 168
Production of Selected Industries

Industry	Unit	1980†
Cotton Textile (Mill Sector)		
Yarn	Lakh kg	1728
Cloth	Lakh mts	10817
Caustic Soda	'00 Tonnes	937

Salt	'00 Tonnes	41609
Vegetable Oil Products (Vanaspati)	,,	655
Sulphuric Acid	,,	3725
Super Phosphate (P_2O_5)	,,	1293
Refractories	,,	128
Sanitary Wares	,,	N. A.
Stonewares:		
Pipes	,,	32
Other kinds	,,	17
Cement	'000 Tonnes	1832
Flour milling& grinding	,,	84
Power driven Pumps	'000 Numbers	57

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† Provisional

Table 169
Factories

Item	*1979*	*1980*
Number of working factories	10611	10674
Average number of persons employed daily in working factories	639104	635784

Education. Gujarat is well ahead in education. With a literacy rate of 43.75 per cent in 1981, it ranked 11th among the States and Territories of India. There are eight Universities in the State: (1) M. S. University, Baroda; (2) Gujarat University, Ahmedabad; (3) Sardar Patel University, Vallabh Vidyanagar; (4) Gujarat Vidyapeeth, Ahmedabad; (5) Saurashtra University, [illegible]kot; (6) South Gujarat Univers[illegible], (7) Gujarat Ayurveda Universi[illegible]nagar; (8) Gujarat Agricultural [illegible]ity, Ahmedabad.

Table 170
Education

Item	*1979-80*	*1980-81*‡
(1) *Institutions*		
Primary	24558	24500
Secondary	2996	3050
Higher	368*	370*
Others	10518	4615
(2) *Pupils (In '000)*		
Primary	4993	5110
Secondary	929	986
Higher	173	181
Others	435	240

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‡ Provisional
* Including University Teaching Departments

Tourism. Places of tourist interest in the State are given below.

Ahmedabad is the second largest textile centre in India. The city contains numerous monuments of the fifteenth and sixteenth centuries, most of them the products of synthesised Indo-Islamic culture.

Baroda. Places of interest are Laxmi Vilas Palace, one of the most beautiful palaces in India, Old Nazar Bagh Palace. Museum and Public Park, Jubilee Garden, Kirti Mandir and Baroda University.

Porbandar is the birthplace of Mahatma Gandhi.

Prabhas Patan is the site of the famous Somanath Temple which was destroyed and rebuilt many times over. Its last construction was begun in 1951. *Siddhagiri* or *Siddhachala* or the Hill of the Perfected Ones is sacred to the Shvetambara Jains and contains a number of temples, the most important of which is of Adishvara Bhagavan.

162. HARYANA

The modern State of Haryana came into being on November 1, 1966 as a result of the re-organisation of the old Punjab State into two separate States. It was formed as a linguistic State, on the pattern of other States in India, the Hindi-speaking areas of Punjab having been assigned to it.

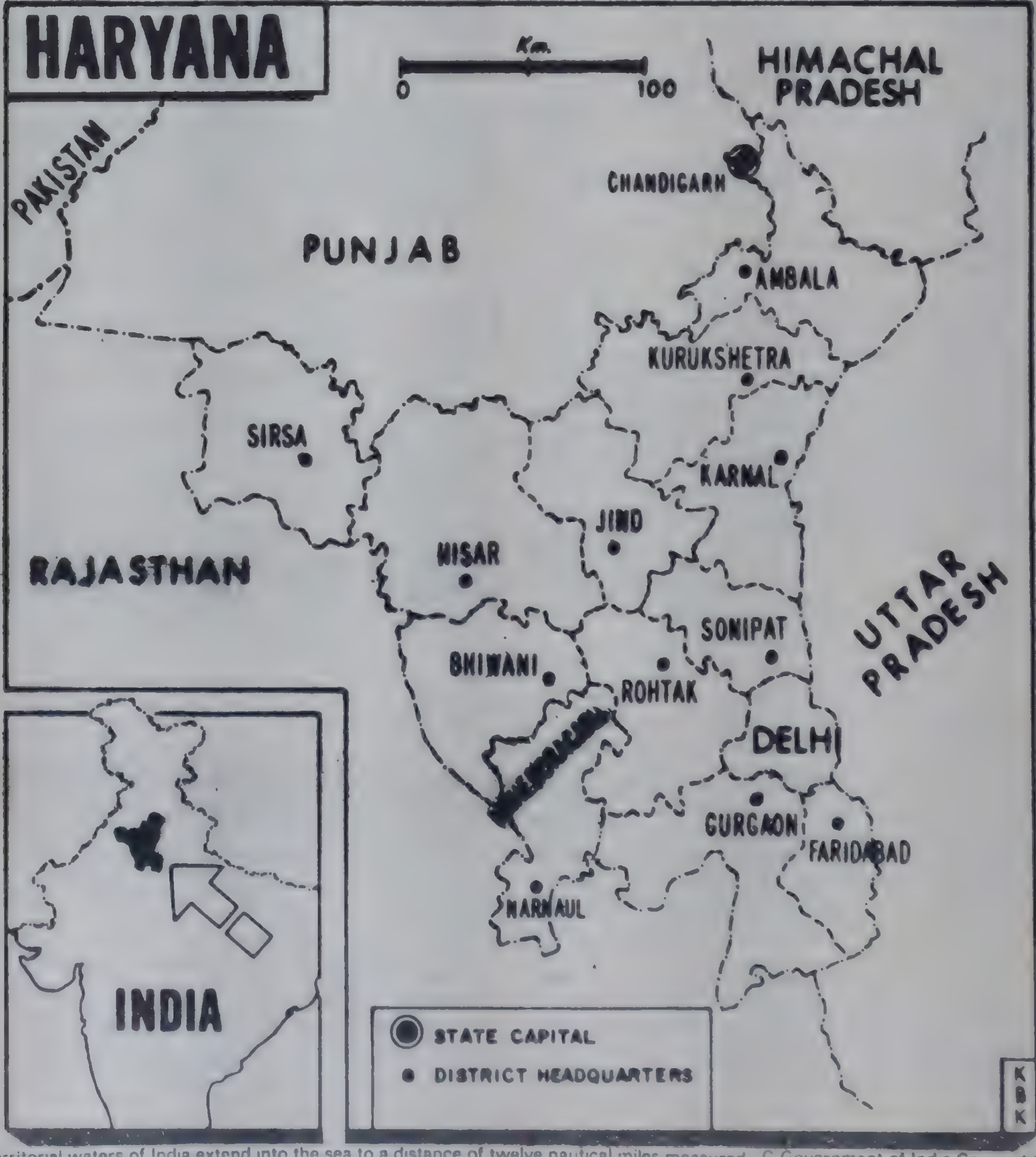
The State is bounded by UP in the east, Punjab on the west, Himachal Pradesh in the north and Rajasthan in the south. The Union Territory of Delhi juts into Haryana and is encompassed by it on three sides.

Physiography. Haryana can be divided into two natural areas, Sub-Himalayan *terai* and the Indo-Gangetic plain. The plain is fertile and slopes from north to south with a height above the sea level averaging between 700 and 900 ft. The south west of Haryana is dry, sandy and and barren. Haryana has no perennial rivers like its parent State Punjab or its eastern neighbour UP. In this respect, it has more affinity to its southern neighbour, Rajasthan. The only river which flows through Haryana is the Ghaggar, which passes through the northern fringes of the State, This river identified by some historians as the river Drishavaditi of Vedic fame is not perennial. Rainfall is meagre, particularly in the district of Mahendragarh and Hissar.

Owing to lack of perennial rivers Haryana's surface drainage is poor. Therefore, much of the rainfall seeps down into the earth replenishing the stock of underground water. Haryana taps this underground water by tubewells of which it has many. Nearly one-third of Haryana's total irrigation water (32.3%) is provided by tubewells. However, this spells trouble during seasons of abnormally heavy rainfall as in 1977. In 1977, Haryana, along with the rest of north western India, received 20% of more rainfall in excess of the normal. This caused high floods and heavy damage. But such rainfall—for good or ill—comes only very rarely, perhaps once in a century.

Climate. For most of the year, the climate of Haryana is of a pronounced character, very hot in summer and markedly cold in winter. The maximum temperature is recorded in the months of May and June when it goes upto as high as 46 degree C. The temperatute falls to the lowest in January.

There are two well-marked seasons of rainfall in the State: (i) the monsoon period lasting from the middle of June till September on which autumn crops and and spring sowing depend, and (ii) the



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

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winter rains which occur from December to February. The Dec.-Feb. rains, though often insignificant in quantity, yet materially affect the prosperity of the spring harvest.

History. Haryana has a proud history going back to the Vedic age. The State was the home of the legendary Bharata dynasty, which has given the name Bharat to India. Haryana is immortalised in the great epic Mahabharata. Kurukshetra, the scene of the epic battle between the Kauravas and the Pandavas, is situated in Haryana. The state continued to play a leading part in the history of India till the advent of the Muslims and the rise of Delhi as the imperial capital of India. Thereafter, Haryana has functioned as an adjunct to Delhi and practically remained anonymous till the first war of Indian independence in 1857.

The people of Haryana joined the leaders of the Indian revolt against the British Government. When the rebellion was crushed and the British administration re-established, the Nawabs of Jhajjar and Bahdurgarh, the Raja of Ballabhgarh and Rao Tula Ram of Rewari of the Haryana region were deprived of their territories. Their territories were either merged with the British territories or handed over to the rulers of Patiala, Nabha and Jind. Haryana thus became a part of the Punjab province. A long period of deliberate neglect began.

On the eve of independence, the region was a sandy barren expanse. It lagged far behind the Punjab region in development and economic progress. All these years the people had been struggling for a State of their own. The form of the struggle, however, depended upon the exigencies of the situation. After the introduction of the Montague—Chelmsford Reforms, representatives of Haryana including the late Chhoutu Ram raised their voice in the legislature in support of the demand for a Haryana State. They demanded an adequate share in development projects. Since politics in prepartition Punjab was dominated by Lahore and areas to the west of it, the demand was not considered sympathetically. The region, however, acquired importance after independence on account of the division of Punjab. The influx of refugees from West Pakistan into Haryana areas enriched the region to a great extent and speeded up the progress of political growth. In the changed situation and circumstances, it was quite natural that the demand for a separate State of Haryana should become acceptable. It was under these circumstances that Haryana was formed as a separate State.

Administration

Legislature. The legislature consists of only one house—the Legislative Assembly. At present there are 90 members in the Legislative Assembly (Vidhan Sabha). The State is represented by 10 members in the Lok Sabha and 5 members in the Rajya Sabha.

The State is divided into 12 districts as below.

Table 171

Area and Population Districtwise 1981

District	*Area sq. km*	*Population*	*Head-quarters*
Ambala	3832	1409463	Ambala
Kurukshetra	3740	1130026	Kurukshetra
Karnal	3721	1322826	Karnal
Jind	3306	938074	Jind
Sonepat	2206	846765	Sonepat
Rohtak	3841	1341953	Rohtak
Faridabad	2150	1000859	Faridabad
Gurgaon	2716	849598	Gurgaon
Mahendragarh	3010	959400	Narnaul
Bhiwani	5099	920052	Bhiwani
Hissar	6315	1496534	Hissar
Sirsa	4276	707068	Sirsa
State	44212	12922618	Chandigarh

Agriculture. Haryana was deficit in foodgrains at the time of its formation in 1966. Since than it has come a long way. During kharif 1981, 18.80 lakh tonnes of foodgrain production was achieved and this is the highest achieved so far since the formation of the State. Wheat production is estimated at 36.26 lakh tonnes during rabi 1981–82 which is also the highest achieved so far. During 1982-83 the foodgrain production is likely to reach 71.40 lakh tonnes. The production of wheat has tripled, the production of rice has risen six times, while that of cotton has doubled. The state has not only become self-sufficient but is contributing a sizeable chunk of its agricultural produce to the Central pool.

Haryana is the first State in North India to have introduced crop insurance for the economic benefit of the farmers. During 1981 the scheme was introduced in the State in 17 tehsils. The scheme has been further extended during rabi 1981–82 covering the entire State for wheat, 11 tehsils for barley, and 12 tehsils for gram.

Irrigation. A vastly improved and sophisticated irrigation system has contributed significantly to the breakthrough in agriculture in the State. In Haryana its development has been an uphill task. Water had to be raised literally from lower to the higher levels and drier slopes. It was a bold new endeavour that gave practical shape to lift irrigation for the first time in India.

The pioneer project Jui, Loharu and Sewani Lift Irrigation Schemes have already been completed. The Jawaharlal Nehru Lift Irrigation Scheme, the biggest of its kind, will also be completed soon. On completion of all these lift irrigation schemes, additional irrigation to 2,85,000 hectares will be achieved. 42,000 hectares area in the drought-prone belt has already been covered by the end of 1979-80.

The Western Yamuna Canal and the Bhakra Canal systems have been linked to divert water from one system to another to optimise the use of limited canal water. Flood waters are being harnessed to serve the irrigation needs through a comprehensive flood control and drainage programme. High priority has been accorded to the bricklining of existing channels and water courses to save precious water from seepage. The State has borne a large chunk of the expenditure in the farmers' fields as well. The assistance of the World Bank has been taken for this project.

The minor irrigation programme has taken major strides in the drilling of over 1645 augmentation tubewells to increase water supply in canals and drilling of 1670 deep tubewells to facilitate direct irrigation where shallow water is scarce.

Sprinkler irrigation has been of special significance and advantage to vast areas of Haryana which are highly undulating and of sandy nature which could not receive flow irrigation. Now, 7000 sprinkler irrigation sets are in operation in the State with Government subsidy.

Haryana has been in the forefront in ground water development and exploitation. Today, there are 2919 energised State tubewells out of a total of 3315 drilled tubewells. A pioneer project for the conjunctive use of surface and ground water with the aid of 500 augmentation tubewells along various canals in the State is on the anvil.

Haryana's best hope for irrigation lies in the Ravi-Beas waters. Under the tripartite SYL agreement signed with the blessings of the Prime Minister, 3.5 M.A.F. water would be made available to Haryana, raising irrigation potential to cover additional 5.67 lakh hectares of land. Haryana has constructed 91.15 km length of SYL canal. When its link with 107.25 km channel in the Punjab territory is established, food production would increase by Rs. 140 crore.

Power. Power is an essential ingredient of modernisation. General prosperity in evidence in various facets of the State's economy notably in agriculture and industry is to a large extent due to the efficiency of the State's electricity organisation.

Power generation and distribution systems have been enhanced manifold. The consumption of power which was 17 lakh units a day in 1966 has now touched 167 lakh units a day. The system has grown to include 34,000 grid-sub-stations and pole-mounting sub-stations and 1.12 lakh km circuit length of electricity lines.

For accelerated growth of power generation, high priority is accorded to thermal power. The State has commissioned three thermal plants of 60 MW each at Faridabad and two of 110 MW capacity each at Panipat. Work on two more 110 MW units and one 210 MW unit is in progress at Panipat. An 800 MW thermal power station will be constructed near Yamunanagar.

For additional power supplies, hydro-electric potential is being harnessed in collaboration with other States. The State would be getting a substantial share of power from 1020 MW Nathpa- Jhakri Hydro-Electric Project regarded as a symbol of inter-state cooperation between Himachal Pradesh and Haryana. Besides, a 64 MW Hydro-electric project on the Western Yamuna Canal is coming up fast.

Today, the State is catering to the power needs of 42,000 small and medium scale and over 700 large scale units spread over more than 40 industrial areas in the State.

Power has made a significant contribution to the green revolution in the State by energising 2,50,000 tubewells, 1468 augmentation tubewells along the canals and 1500 Government-owned big tubewells and executing various lift irrigation schemes.

In the field of rural electrification, Haryana has an impressive record being the first State to have electrified all its villages. Under a time-bound programme, Haryana achieved 100% electrification of Harijan bastis in November, 1981, way ahead of all other states in the country.

Street light is also being provided in villages in a phased programme. More than 4000 villages have since been provided with street lights. The target is to complete this work by 1984.

White Revolution. The land once flowing with milk and honey, as the saying goes, is again on the threshold of a white revolution. The per capita consumption of milk and milk products is higher in Haryana than that of any other State in the country. It has earned the distinction of being the home of the world famous Murrah buffalo and the Haryana cow. The Murrah buffalo leads all other breeds in milk yield. Some of the Murrah buffaloes yield even more than 3500 kg of milk per lactation which stands in fair comparison with the yield of the best European breeds of dairy cattle. 'If seeing is believing, you have to go to the Haryana Agricultural University ro know what buffaloes and other cattle mean to Haryana's economy and with what loving care the animals are looked after.' Haryana supplies Murrah breed of bulls to various parts of the country for raising the quality of the stock.

Today, Haryana has a livestock population of 69.05 lakh. 351 veterinary hospitals, 298 dispensaries, 7 mobile dispensaries and 5 disease-diagnostic laboratories are functioning in the State to provide health cover to its livestock. The State is self-sufficient in the production of various animal vaccines at the Haryana Veterinary Vaccine Institute and it contributes a large quantity of these vaccines to the neighbouring States. Haryana is fortunate enough to control the Rinderpest disease and the State is now free from this menace.

Stock-raising is an important economic activity in the State. Cross and selective breeding programmes are undertaken for development of livestock and to improve the milk yield of cattle, with exotic breeds and artificial insemination. The known exotic Jersey and Holstein bulls are now produced within the State at the Indo-Australian Cattle Breeding Farm, Hissar. 1514 stockmen centres, dispensaries and hospitals are operating in the State to extend the benefits of scientific breeding to far-flung areas.

A vast network of Milk Producers Cooperative Societies is operating under a three-tier system with the State Milk Cooperative Federation at the apex, milk unions at district level and primary milk societies at the village level. Milk procurement has touched a new high of 293.49 lakh litres per day as against 8832 litres per day during 1970-71. The turnover of the Federation has touched Rs. 925.29 lakh.

Five milk plants at Jind, Bhiwani, Ambala, Rohtak and Ballabgarh with a total capacity of 2.35 lakh litres of milk per day are in operation in the State in the Cooperative sector. One milk plant is under construction at Sirs[illegible] with a handling capacity of one lakh litres of milk daily.

Operation Flood-II programme with an outlay of Rs. 33.00 crore is being taken up in the State. Under this programme one more milk plant hav[illegible] a handling capacity of 60,000 litres of milk per day will be set-up at Karnal and the existing capacity of the milk plants located at Jind, Ballabgarh, Ambala and Bhiwani will be increased from 1.35 lakh litres per day [illegible] lakh litres per day, during the next five years. This would raise the total installed capacity to 5.30 lakh litres per day.

About 34000 families of the weaker sections of society (small-marginal farmers and landless agricultural labourers) have benefitted from crossbreed calf rearing, popultry, piggery and sheep units set- up with the help of loan and subsidy.

Forest Department. Forests check air-pollution, improve the environment, arrest the advance of the desert and add to the wealth of the nation.

Fully conscious of the important role played by forests in the development process, Haryana has embarked upon a massive tree plantation programme covering 67000 hectares farm land under the social forestry project at a cost of Rs. 33 crore. This programme is aided by the World Bank and is aimed at achieving the twin ojectives of maintaining ecological balance and beauty of landscape. The forests, at present, cover only 3.7% of the total area of Haryana. The forest cover in the region which was once infested with lush green forests, had shrunk to 3.1% by the time Haryana emerged as a State.

The forest development programme will provide employment for the weaker sections. The social forestry scheme is expected to generate 100 million man-days of direct employment for un-skilled agricultural labour. These plantations will help in stabilisation of mobile sand-dunes in the western and south-western areas of the State and check soil erosion in the sub-montane areas.

The success and momentum of the social forestry programme in Haryana in the last two years has the making of a legend. The State has multiplied its achievements in recent years. It registered a four-fold increase in 1981-82 by planting about six crore trees as against 1.50 crore trees planted in 1980-81. When seen in contrast with a mere 25.30 lakh trees planted in 1970-71 under the afforestation programme this shows a striking increase by 24 times. Encouraged by this enormous increase, the State has fixed a target of 12-crore plantations for the year 1982-83, which is twice the number of trees planted last year.

The World Bank has observed that the high level of success achieved in Harayna offers a fine example to other states in India of what can be achieved in afforestation.

The "A Tree for Every Child" Programme is being pursued vigorously in the State. Under this programme all children in the age group 6-14 in the two selected blocks of each district are being involved in tree planting in the institutions/schools where they are receiving education.

Roads and Transport. Haryana earned the distinction of linking all its villages having a population of 250 persons and above except villages falling in Khadar area of Yamuna Sahbi Nadi by metalled roads in the year 1980-81, yielding significant improvement in the means of transportation and communication by road. Haryana is now well-supplied with a network of roads and bridges which has enabled development to reach the doorstep of the village dweller. In 1966, only 1386 villages out of 6731 were linked by metalled roads. The well maintained highways are a motorist's delight.

Roads have been stretched from 5100 km in 1966 to 18970 km upto 30. 9. 1982. These all-weather roads serve 1287 lakh registered vehicles in the State and a number of vehicles from other states criss-crossing Haryana.

Passenger road transport is completely nationalised in Haryana and is operated by 'Haryana Roadways'. Sustained by a network of roads, Haryana Roadways has played a notable role in the development of communications in the State. The roadways today carry 9.00 lakh people daily in 2642 buses over a distance of 7.00 lakh km operating through 14 depots. One of the most efficient nationalised road transport undertakings in the country, Haryana Roadways has become the first choice of bus passengers and the envy of other State transport undertakings. Haryana Roadways earned a handsome profit during the year 1981-82 while generaring Rs. 33.87 crore for the state exchequer.

Rural Water Supply. Drinking water supply through taps has been taken to the villages. Women in rural Haryana had to trudge over miles and miles to fetch a pitcher of drinking water. To alleviate the woes of the village community, Haryana has set aside substantial funds to bring this basic need within the reach of the rural population in a phased programme.

In the year of the formation of Haryana drinking water facilities were available in only 170 villages. Today, 2000 villages excluding 50 'Dhanis' have the facility of tap water supply. By the turn of the present decade, all the problem villages in Haryana, which number 4690, will have been covered under the accelerated water supply schemes.

Education. Haryana has free and compulsory elementary education. Primary schooling facilities are available to almost all the school-going children in the age group 6-11. There is a primary school within a radius of 1 km.

Educational facilities have recorded a phenomenal growth since the formation of Haryana, both qualitatively and quantitatively. The number of schools has gone up from 5,779 in 1966 to 7,654 at present, and that of colleges from 45 to 123. There are now 20.83 lakh students, comprising three times as many boys and four times as many girls in the schools and colleges of the State. The State's three Universities —Kurushetra University at Kurushetra, Maharshi Dayanand University at Rohtak and Haryana Agricultural University at Hissar—are opening new horizons to those seeking new vistas in the field of human knowledge.

The State has a unique institution of its own kind in Asia in the Motilal Nehru School of Sports at Rai. This school is a many-faceted institution. It seeks to develop the all-round personality of its students. It is not merely coaching youngsters in physical activity, games and athletics on scientific lines. It has much more to it—discipline, recreation, fun, entertainment, hobby, cultural activities and academics. All those have a bearing on character building. Such an education prepares children for the higher values of life, inspiring confidence and quality of leadership in them.

Special emphasis is being given to remove adult illiteracy which is still high in rural areas. About 3,400 adult education centres are functioning at present, which includes 3050 centres opend in the villages. During the current year, 400 additional centres would be set up to cover more adults under this programme.

A monthly attendance scholarship of Rs. 10 is being given to 40,000 Harijan girl students in schools as an incentive to avail themselves of educational facilities. All Harijan girls in primary and middle classes are being provided uniforms free of cost.

Health. Measures have been taken to provide greater health facilities to the people nearer their homes. Today, specialist services are available in all big hospitals. The accessibility of health and medical services in the rural areas has been substantially reduced in recent years and no villager has now to walk more than 5-6 km to get health care. Casualty medical services are available in all medical institutions along the highways and in the industrial towns of the State. Three ESI hospitals with 320 beds and assisted by 54 dispensaries are providing health cover to industrial workers and their families. The hospitals are well equipped with diagnostic and surgical aids. Various specialities are available at subdivisional level hospitals. There are 85 hospitals (52 State Public, 15 State Special and 18 others). 89 Primary Health Centres, 249 Dispensaries (169 State Public, 72 State Special and 8 others), 21 subsidiary Health Centres, and 1140 sub-centres operating in the state. Besides 358 Ayurvedic/Unani dispensaries, two 10-bed Ayurvedic/Unani hospitals and a 25-bed Ayurvedic Wing in the Civil Hospital at Bhiwani are providing medical aid. There is a medical College at Rohtak.

Though leprosy incidence is rare, only .008 per thousand, multi-drug therapy for curing leprosy cases has been introduced this year for the first time.

The number of BCG vaccinations done from 1-1-81 to 31-3-1982 is 4,84,058. Preventive and curative measures are being taken under the National Tuberculosis Control Programme. National programme for control of blindness is being implemented in 11 districts and 85 primary health centres.

A massive family welfare programme has been launched to educate the people to adopt the small family norm as a way of life. More than six lakh people have already adopted sterilisation voluntarily and lakhs of men and women are practising other methods of family planning.

Industrial Growth. Haryana had little in the way of industty in 1966. It has since achieved a high level of industrialisation with the systematic planning of its industrial activity, rationalising its existing industries and promoting establishment of new ones, in an atmosphere of harmonious industrial relations.

The rapidly expanding Faridabad-Ballabgarh Industrial Complex has developed into one of the most important industrial centres in the country, and marked development has taken place at other industrial towns like Gurgaon, Sonepat, Rohtak, Bahadurgarh, Hissar, Jagadhri, Panipat and Ambala.

Today, the State has a very sound industrial base, small scale units have increased about eight times from 4,519 in 1966 to over 35000. The volume of exports has attained commanding heights from a mere Rs. 4.55 crore in 1967-68 to Rs. 110 crores.

Two out of every three tractors in the country and one out of every five bicycles are manufactured here. Ambala alone exports 35 per cent of the country's total export of scientific instruments. Yamuna Nagar meets 60 per cent of the demand of ammunition boxes of our Defence Forces and Panipat supplies 75 per cent of the total needs of woollen blankets to the Indian Army.

There are 286 large and medium scale units producing goods worth over 2,000 crore rupees in a year. Besides letters of intent and 40 per cent industrial licences have been issued by the Government of India in Haryana.

Dispersal of industries in the rural area is being vigorously pursued. A liberal package of incentives has been made available to attract entrepreneurs to set up industrial units in the hitherto ignored rural areas. Under this scheme, 9397 units have been set up. These units have provided employment to 29,447 persons of which 17067 persons belong to the weaker sections of the society. Bona fide residents of Haryana in the age group of 18-55 can set up such an industrial unit with an investment ceiling of Rs. 2 lakh.

Tourism. Haryana is a trend-setter for other States in the promotion of tourism in the country. The development of tourism in the state has shown how much comfort can be provided to a weary traveller by a caring State. A thriving tourist industry with a vast range of services through a network of 31 tourist complexes attracts more than 18 lakh foreign and domestic tourists every year.

Haryana Tourism has become legendary, though tourist consciousness in the State is a recent phenomenon. It evolved an entirely new concept of tourism. Tourist havens were created by exploiting all available potential and by creating entirely new landscapes. Basic comforts and necessary amenities were provided on the National and State Highways. Comfort, recreation and pleasure was provided to tourists as well as local residents. Facilities were available for the affluent as well as the budget tourist.

The Golden Triangle of India, Delhi–Agra–Jaipur and other places of tourist interest in the north, viz., the Kashmir Valley, Simla, Amritsar, Chandigarh and Bhakra–Nangal hold great charm for potential tourists, both foreign and domestic. Haryana girdles Delhi from three sides with all the National Highways to these tourist centres running through it.

Today, Haryana's tourist resorts beckon a large number of these tourists who prefer to rest a while in Haryana before reaching out to other tourist destinations in north India.

Hotel 'Rajhans' is the latest and the most prized possession of Haryana Tourism. It is a super complex which, in fact, has no equal in its size and facilities. 'Rajhans' stands above Suraj Kund and overlooks the Peacock Lake and is eager to bestow its stately comforts to foreign and domestic tourists coming to Delhi or Haryana.

As a recognition of its excellent performance, Haryana Tourism has repeatedly won prestigious awards from the Pacific Area Travel Association and the Travel Agents Association of India.

Having acquired considerable expertise in the field of tourism, Haryana Tourism is also operating consultancy services. Various States/Organisations are deriving benefit from these services. Experts in Architecture, Landscaping, Interior Decoration, Construction and Publicity are available to provide an entire package of services associated with the construction and running of hotels and restaurants.

163. HIMACHAL PRADESH

Himachal Pradesh became a fullfledged State of the Indian Union on January 25, 1971. With an area of 55,673 sq. km it is larger than Punjab, Haryana or Kerala, but in population it stands much below Kerala, Punjab or Haryana. Historically, the 18th State in the Union, Himachal Pradesh is also the 18th in population (1981 census) but the 14th in area.

Physiography. Himachal Pradesh is situated in the north west corner of India, right in the lap of the Himalayan ranges. It is surrounded by Jammu and Kashmir in the north, Uttar Pradesh in the south east, Haryana in the south and Punjab in the west. In the east, it forms India's boundary with Tibet.

The State is almost entirely mountainous with altitudes ranging from 460 to 6400 metres above sea level. It has a deeply dissected topography, a complex geological structure and a rich temperate flora in sub-tropical latitudes.

Physiographically, the State can be divided into two regions, southern and northern. The southern part of Himachal Pradesh is almost as hot as the plains, while the northern region has a temperate summer and a winter with extreme cold and heavy snowfall. The districts of Simla and Sirmaur have alluvial soil, while the remaining ten districts have forest and hill soils. The normal rainfall of Himachal is 181.6 cm. Maximum rainfall is noticed at Dharmasala in Kangra district.

Rivers. Himachal Pradesh is drained by a number of rivers, the most important of which are Chenab, Ravi, Beas, Sutlej and Yamuna. All these rivers are snow-fed and hence perennial. Besides, the natural reservoirs and the large drops available in the river courses provide immense potential for hydel power generation at a low cost.

Formation of the State. Himachal Pradesh was originally formed as a centrally-administered Territory on April 15, 1948 by the integration of some thirty and odd Punjab Hill States. In 1951, it became a 'Part C' State under a Lt. Governor, with a legislative Assembly of 36 members and a Cabinet of three ministers. In 1954, Bilaspur, another 'Part C' State was merged with Himachal Pradesh and the strength of the Assembly was raised to 41 members.

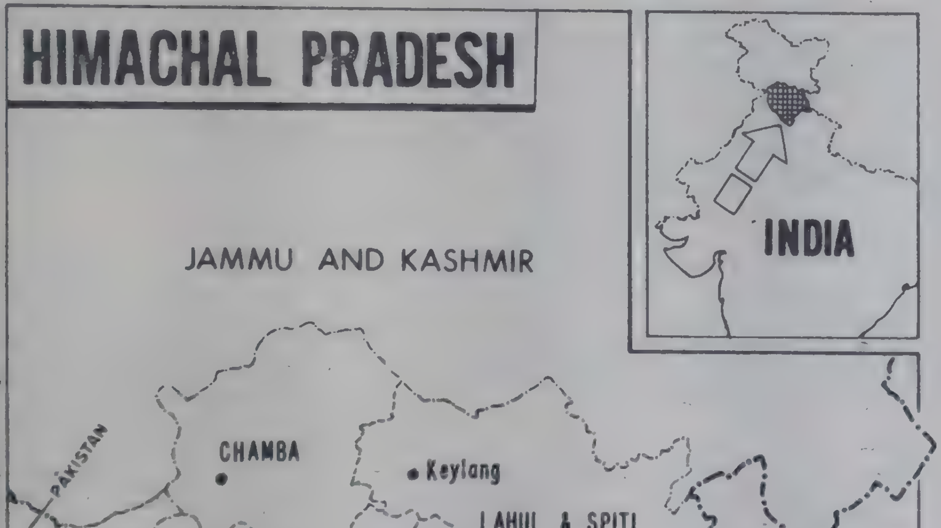
In 1956, the States Re-organisation Committee recommended the merger of Himachal Pradesh with Punjab. But the people of Himachal Pradesh so stoutly opposed the merger that it was not put into effect and Himachal Pradesh continued to retain its separate identity. On November 1, 1956, it was reverted to the status of a Union Territory under an Administrator designated as Lt. Governor and its Legislative Assembly was abolished. In its place, a Territorial Council was constituted in 1957. It had only limited powers and could administater only such subjects as were specifically transferred to it. Under the Constitution (Fourteenth Amendment) Act, 1962 Himachal Pradesh was declared a Union Territory in 1963 with a legislative Assembly and a Council of Ministers.

Till October, 1966 Himachal Pradesh consisted of only six hill districts-Mahasu, Mandi, Chamba, Sirmaur, Bilaspur and Kinnaur. In November, 1966, it was enlarged by the addition of some of the hilly areas of Punjab-Simla, Kangra Kullu, Lahaul and Spiti districts and the Nalagarh tehsil of Ambala district and areas of Hoshiarpur and Gurdaspur districts.

Himachal Pradesh was re-organised into 10 districts and declared a State on January 25, 1971 with Simla as its capital. In 1972-73, the districts were reshuffled bringing up their number to 12.

Administration. There is only one house of legislature i. e. Vidhan Sabha, with 68 members.

The State is divided into the following 12 districts:



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

Based upon Survey of India map with the permission of the Surveyor General of India
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Table 172

District—Area and Population

District	Area (sq. km)	Population 1981	Density per (sq.km)
Bilaspur	1167	247368	212
Chamba	6528	311147	48
Hamirpur	1118	317751	284
Kangra	5739	990758	173
Kinnaur	6401	59547	9
Kullu	5503	238734	43
Lahaul & Spiti	13835	32100	2
Mandi	3950	644827	163
Shimla	5131	510932	100
Sirmaur	2825	306952	109
Solan	1936	303280	157
Una	1540	317422	206
H. P.	55673	4280818	77

Agriculture: Agriculture and horticulture are the mainstay of Himachal's economy as 75 cent of people are engaged in these pursuits. Irrigated area forms 15.8 per cent of the net area sown. However, the agro-climatic conditions in the state are more suitable for growing a wide variety of fruits and cash crops like seed potatoes, ginger, vegetable seeds, apples, stone fruits, etc. Wheat, maize and paddy are the major cereal crops under cultivation. The production of foodgrains during 1979-80 was about 8.82 lakh tonnes as against 7.01 lakh tonnes during 1966-67 when the State was re-organised.

Horticulture: Himachal Pradesh is gifted with a variety of agro-climatic conditions owing to different elevation zones which make it an ideal region for growing many kinds of fruits. The State government has exploited this natural advantage by steadily expanding the area under horticulture. The area under fruits which in 1966-67 was 26,163 hectares increased to 92,467 hectares in 1980-81.

Besides accelerating the pace of horticultural development through the expansion of direct plantation in the potential areas, the programme of top-working of wild fruit trees into superior varieties is also carried on. During 1981-82 about 12 lakh wild fruit trees were top-worked into superior varieties of fruits.

All these activities have resulted in a phenomenal increase in fruit production. From a meagre 0.45 lakh tonne of fruit in 1966-67 production rose to 2.46 lakh tonnes in 1975-76. The production of fruits during 1981-82 stood at 3.42 lakh tonnes.

Stres is also being laid on the development of new crops like hops, olives, figs and mushrooms, for which the Pradesh holds ample potential.

Animal Husbandry: The rugged terrain of Himachal Pradesh and its small and fragmented holdings make it impossible to mechanise cultivation. As such, only bullocks are used for agricultural purposes. Rearing of goats and sheep is also important as these provide wool, hair and meat to the mountain populace. Livestock population for the last two quinquinnial censuses is given hereunder:-

Table 173

Livestock Population

(in thousands)

Livestock	1972	1977
Cattle	2176	2106
Buffaloes	544	560
Sheep	1040	1055
Goats	906	1035
Horses and Ponies	16	15
Mules	12	14
Pigs	3	5
Other Livestock	5	5
Total	4702	4795
Poultry	189	330

Forests: Forests cover an area of 21,169 square kilometres which accounts for 38.0 per cent of the total geographical area of the State. The national forest policy lays down that in hilly States like Himachal Pradesh, 60 per cent of the total geographical area should be under forests. This makes Himachal Pradesh an under-forested State.

Most of the forests belong to Government. Deodar, kail, chil, spruce, silver fir and neoza pine are the coniferous species growing in the forests. Neoza pines which produce edible nuts grow in Kinnaur district. These are the only forests in neoza in India. Among the broad-leaved species, sal, ban, oak, walnut, maple, horse chestnuts, poplar, seemal, tun and shisham are the important species.

Minerals: Important minerals of Himachal Pradesh are salt, slate, gypsum, limestone, barytes, dolomite, pyrites, etc. The Pradesh is also known to have iron ores, copper, lead, phosphate and several other minerals which await proper investigation and surveys for their exploitation. Rock salt deposits are located in Mandi district and gypsum in Sirmaur district. Vast deposits of slate are found in Mandi, Chamba and Kangra districts. Limestone is found in abundance in Sirmaur, Bilaspur, Kangra, Mandi and Shimla districts. Sirmaur, Bilaspur and Kangra deposits of limestone are of a quality suitable for cement industry.

Power: Himachal Pradesh has a vast hydro-electric potential which is estimated at 12,500 MW. The total installed capacity (hydro and diesel) in Himachal Pradesh as on 31st March, 1981 was 129.03 MW. (hydro 126.52 MW and diesel 2.51 MW). Major hydro electric projects of the Pradesh are Giri and Bassi. Besides, Joginder Nagar (Shanan) hydro-electric project of Punjab State Electricity Board, Baira-Siul hydro-electric project of National Hydro-electric Corporation and Beas-Sutlej link hydro-electric project of Bhakhra Management Board are also located in Himachal Pradesh.

Out of 16,916 villages in the State, 11,217 had been electrified by the end of March, 1982.

Table 174

Generation and Consumption of Electricity

(In million KWH)

Item	*1979-80*	*1980-81*
Electricity generated	354.9	244.1
Electricity purchased	232.9	265.4
Electricity consumed	216.3	264.7
Electricity sold to other State Electricity Boards	258.5	147.1

Source: H. P. State Electricity Board.

Industries: Himachal Pradesh continues to be industrially backward despite vast natural resources endowment and plentiful availability of cheap hydel power. At the end of 1980-81, there were about 9200 small scale industrial units in organised sector employing about 40,000 persons besides numerous cottage and village industrial units. The commissioning of most modern and sophisticated fruit processing plant at Parwanno with a capital outlay of about Rs. 4.00 crores has been a landmark in the history of fruit processing in India. As a result of various concessions/incentives, the pace of industrialization picked up and 43 medium and large scale projects were approved involving an investment of Rs. 83.73 coroes and an employment potential of 7760 persons. Among major and medium industries, mention may be made of Nahan Foundry, Nahan; Rosin and Turpentine Factories at Nahan and Bilaspur; Mohan Meakin Breweries, Solan; United Diamonds, Ltd., Parwanoo. District Industries Centres in all the 12 districts are functioning in the State with a view to accelerating industrial growth.

Transport: Road transport is the principal mode of transportation in Himachal Pradesh. Passenger transport on about 82 per cent of the routes is nationalised and is managed by a government-owned Himachal Road Transport Corporation(H.R.T.C.). The goods transport is mainly with the private sector. There are only two narrow-gauge railway lines connecting Shimla with Kalka (96 km) and Jogindernagar with Pathankot (113 km). Construction work of an aerodrome at Jubbar Hatti which is 25 km from Shimla, has started under the Government of India scheme of connecting all the State capitals by air. Presently, there is also an air service from Chandigarh to Bhuntar in Kulu district.

Drinking Water Supply: Supply of clean and safe drinking water is considered as one of the most important issues not only from a social and economic point of view, but also from a health point of view. Upto March, 1981 as many as 7887 villages had been provided with drinking water supply thereby serving about 19 lakh persons.

Public Health. The health and family welfare services are an important aspect in a welfare State. Special attention has been paid to provision of health and medical care services in the remotest rural areas of the Pradesh. Disease control and eradication programmes have given rich dividends.

Position of health care facilities during 1980 and 1981 in the State are depicted in the following table:

Table 175

Hospitals, Dispensaries and Patients Treated

Item	*1980*	*1981*
Total Medical Institutions (No.)	735	738
Patients Treated ('000 persons)	8858	10063
Beds available	5588	5628
Sterilisation operations performed (No.)	*During*	
	1979-80	*1980-81*
(i) Male	3766	6011
(ii) Female	6745	8961

Under the "Health for All by 2000 AD" programme, health care infrastructure would further be strengthened and even the remotest and difficult areas would be covered by the umbrella of health care services.

Education. According to 1981 census literacy percentage has gone up to 42.48 from 32.96. The State is making commendable efforts not only to push up literacy but also to further the progress of education at all levels. Establishment of an Agricultural University at Palampur and Sainik School at Sujanpur are two important achievements in this direction.

Table 176

Educational Institutions

Item	*1978-79*	*1979-80*
Primary/Junior Basic Education Institutions	4416	4503
Students (Class I to V) 6–11 years*	495	512
Teachers	8518	8645
Middle/Senior Basic Education Institutions	981	1028
Students (Class VI-VII) 11-14 years*	162	176
Teachers	8290	8378
High/Higher Secondary Education a Institutions	614	655
Students (Class IX to XI) 14–17 Years*	66	63
Teachers	10607	10765
College of General Education Institutions	27	27
Students*	13	14
Teachers	626	643

Provisional *in thousands

Source: Education Department, H. P.

Tourism. Himachal Pradesh is studded with a number of hill stations which are refreshingly cool in summer. They offer to the tourists a quick holiday amidst breath-taking scenery. Shimla, Dallhousie, Dharmasala, Kullu, Kasauli, Solan, Chail and Kufri are some of the famous hill stations in Himachal Pradesh.

Himachal Pradesh abounds in wild life among which are some rare species like musk deer, ibex, thar, Himalayan brown bear and snow leopard among animals and monal, tragopan, Kokiash and snowcocks among birds. The rivers offer ideal fishing grounds for trout in Katrain, Rohru and Barot and for masheer in Maryoga, Karganuand and Dedahu.

164. JAMMU & KASHMIR

Jammu and Kashmir occupies the north western tip of india and is surrounded on three sides by foreign countries—Pakistan and China. The States of Punjab and Himachal Pradesh connect it to the rest of India. Kashmir, as a border state, is involved in international complications. As a matter of fact, parts of the old Jammu & Kashmir are still under the illegal occupation of Pakistan and China (see *Administration*).

The State is almost entirely mountainous, broken by stretches of valleys and dotted with mountain lakes. It may be geographically divided into three distinct regions: (1) Tibetan and semi-Tibetan tracts in the north, containing the districts of Ladakh and Gilgit, (2) the middle region of the happy valley of Kashmir and (3) the large level areas of Jammu in the south.

History. Jammu and Kashmir, known shortly as Kashmir, has a history going back several centuries. It has a long and chequered history, with many long periods of political servitude and economic stagnation. Kashmir enters the arena of Indian history with the Mauryas. The Mauryan Empire, in the days of Asoka, extended from Afghanistan in the north-west to Bengal in the east and Deccan in the south. Asoka founded the original city of Srinagar on the site of the present village Pandrethan, about three miles upstream from Srinagar, the present capital.

Under Kanishka, the Kushan Emperor of India, Kashmir became the focus of various cultural activities. A historic conference on Buddhist faith was held in Kashmir under his auspices.

Kashmir lighted up in history during the reigns of some benevolent and far-seeing monarchs from the 8th century AD to the 15th century. Lalitadltya (AD 724—760) was the first of the great kings who ruled over Kashmir. He was a Hindu warrior king, but was tolerant towards all religions and all shades of opinion. He patronised men of letters and supported many *viharas* (monasteries) which became seats of learning. He constructed the famous Martand temple, whose ruins testify to the splendour and massiveness of his conception.

Another illustrious king was Avantivarman (AD 855—883). It was during his time that engineering constructions were put up to prevent floods in the valley of Kashmir, across the narrow gorge at Baramula. This engineering feat was achieved by a Kashmiri engineer named Suya, after whom is named the present town of Sopore. The town of Avantipura named after the king has survived to the present day.

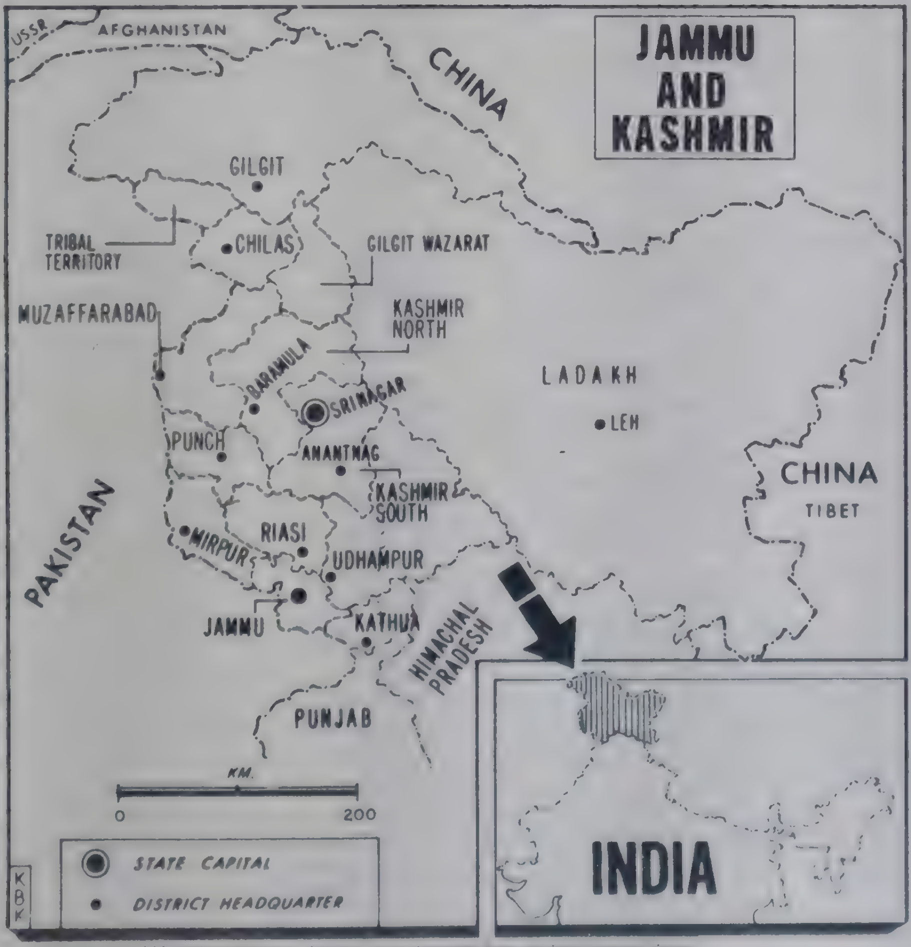
The school of Saivism, which was later to rock Hindu religion for many centuries, was founded in Kashmir by Vasogupta, who wrote 'Spanda Karika'. He was followed by Kallata Bhat who wrote 'Spanda Vrithi' in the ninth century. Soon after came Somananda, with his profound treatise 'Shiva Drishti'. Somananda was followed by other illustrious thinkers and writers like Utpaldeva and Abhinava Gupta (10th century).

Hindu rule passed into decay by the beginning of the 11th century AD and the Kashmir Valley passed into the hands of Muslim rulers. The most notable among them was Sultan Zain-Ul-Abdin (1420-70) who is otherwise known as Badshah.

Sultan Zain-Ul-Abdin was a lover of arts and crafts. He introduced the handicrafts for which Kashmir has since become famous, namely carpet-making, papier-mache, shawl making and embroidery. He dug the Mar Canal which connects Dal Lake with Anchan Lake. He shifted the city of Srinagar to flood-free area, which was also drier.

Akbar conquered Kashmir in 1586. His successors Jehangir and Shah Jehan built stately mansions, planted chinars and laid out splendid gardens around the Dal Lake and elsewhere. The Mughal Gardens extant in the state testify to the artistic tastes of the Mughal Emperors.

The Afghans came after the Mughals. In 1750, Ahmed Shah Abdali occupied Kashmir. From 1819 to 1846, the Sikhs ruled the country. In 1820 Ranjit Singh



Based ... of the Surveyor General of India

The boundary of Meghalaya shown on this map is as int
(Reorganisation) Act 1971 but has yet to be verified

the Sikh ruler, made over the territory of Jammu to Gulab Singh, the Dogra king. Under the Treaty of Amritsar in 1846, Jammu and Kashmir became part of Gulab Singh's territory, under the suzerainty of the British.

With the lapse of British sovereignty on August 15, 1947, India and Pakistan became free dominions and the Maharaja of Kashmir, an independent monarch. The Maharaja entered into a standstill agreement with India and Pakistan to maintain the *status quo*. It was admittedly a transitory step pending negotiations for accession. Pakistan, however, imposed a blockade on Kashmir in order to pressurise the Maharaja into signing the Instrument of Accession in its favour. This was followed by a massive tribal attack supported by the Pakistan army. The Pakistani invasion brought to the fore the question of Accession, which was settled on October 26, 1947 by the Maharaja signing the Instrument of Accession in favour of India.

On accession to India, the Indian army intervened in Kashmir and with the support of the people drove out the Pakistanis from the major portion occupied by them. The cease-fire by the UN, however, made it impossible to beat back the Pakistanis from the entire area and thus a part of the State's territory has since remained under the illegal occupation of Pakistan.

With Pakistani aggression temporarily halted, Jammu and Kashmir set about to put its house in order.

A Constituent Assembly was set up in 1951 to frame a Constitution for the State. Elections to the Assembly were held on the basis of universal adult franchise. The Assembly took historic decisions in ratifying the accession of the State with India, abolishing hereditary rulership in the State and ratifying the transfer of land to tillers without payment of compensation. The monarchical order was formally terminated in November 1952 in pursuance of the Assembly's decision, and the first Head of the State (Sadar-i-Riyasat) was elected. These radical measures were taken with the full support of the Government of India and the Indian Parliament.

In February, 1975 a new chapter opened in the political history of Kashmir as a result of the historic Kashmir Accord between Sheik Mohammed Abdulla and the Govt. of India. Sheik Abdulla returned to power after 22 years. He was originally removed from the premiership by the then Sadar-i-Riyasat.

Following the dissolution of the State Legislative Assembly in March, 1977 fresh elections were ordered in the State. Sheik Abdulla and his party, the National Conference, were returned to power with a massive majority. Sheik Abdulla took over as Chief Minister on July 9, 1977. The new government has embarked upon a programme of socio-economic development as laid down by the National Conference Manifesto and the "Naya Kashmir" programme.

Kashmir and the Indian Union: Kashmir occupies a privileged position among Indian States as regards its relations with the Indian Union. Art. 370 of the Indian Constitution limits the Parliament's powers (over Kashmir) to three subjects—defence, foreign affairs and communications. Other subjects from the Union and Concurrent Lists may be made applicable to Kashmir with the approval of the State (Kashmir).

Administration. The State legislature consists of two houses: (1) the Legislative Assembly and (2) the Legislative Council.

The State is divided into 14 districts.

Table 177

Population as per Census 1981 Districtwise

(Fig. in lakhs)

State/ District	*Population*	*Headquarters*
Jammu & Kashmir State	59.54	
A) Kashmir Province		
Anantnag	6.54	Anantnag
Pulwama	4.04	Pulwama
Srinagar	7.21	Srinagar
Badgam	3.52	Badgam
Baramulla	6.69	Baramulla
Kupwara	3.27	Kupwara
Kargil	0.64	Kargil
Leh	0.67	Ladakh
Total	32.58	
B) Jammu Province		
Doda	4.24	Doda
Udhampur	4.52	Udhampur
Kathua	3.65	Kathua
Jammu	9.28	Jammu
Rajouri	2.98	Rajouri
Poonch	2.22	Poonch
Total	26.89	

Agriculture. The economy of Jammu and Kashmir is largely agrarian. More than 80 per cent of the population depends on agriculture for its livelihood. Paddy, wheat and maize are the major crops. Barley, bajra and jawar are cultivated in some parts. Gram is grown in Ladakh. The area under food crops in 1978-79 was 18.47 lakh acres and under other crops 58.41 lakh acres. The area under high yielding varieties in 1978-79 stood at 10,596,300 acres. Food grain production in 1980-81 is targeted at 13.70 lakh quintals. The State is expected to be self-sufficient in food by the 6th plan end, when the production is likely to touch 17.50 lakh quintals.

Horticulture. The area under fruit growing touched 2.58 lakh acres in 1979-80 against 2.48 lakh acres in 1978-79. Fruit export during 1980-81 went up to 3.60 lakh tonnes against 3.44 lakh tonnes in 1979-80. The fruit production in 1980-81 touched 5 lakh tonnes.

An integrated horticultural development project is under execution with the assistance of the World Bank. The Rs. 25-crore project aims at providing services for apple and walnut grading, processing and marketing of fruit and utilisation of apple culles, which at present go waste. Another Rs. 63-lakh apple grading project is under execution at Nowapora, Sopore with the assistance of the Australian Government.

Forestry. Next to agriculture, forests constitute the most important sector of the State's economy. Forests cover over 20.98 thousand square kilometres in the State. Of this 7477 sq. kilometres are available for exploitation of valuable timber.

A rich variety of spruce, and stately trees such as pine, fir, birch, hazel, wild oak, maple, beech etc. fill the forests.

The graceful birch trees grow at high altitudes. They are found in Lidder Valley, Kolaohai, Gurez and the nearby areas. These areas and the Jhelum Valley, Sonamarg, Gulmarg, Kishtwar and Bhaderwah are rich in pine, fir and deodar. The best varieties of pine and deodar are found in the dense forests of Kishtwar, Bhaderwah and the Lolab Valley.

These forests are a regular haunt of lovers of sport and adventure who can find ibex, musk deer, wolf, fox, red bear, black bear, barasingha, pig etc. A variety of winged game, such as duck, goose, chakor, monal, pheasant, partridges and snipe are found in low forests on swamps and banks of the lakes.

Animal Husbandry. The 1972 livestock census showed 20.57 lakh cattle, 4.93 lakh buffaloes, 10.72 lakh sheep, 5.59 lakh goats, 0.60 lakh horses and ponies and 4.93 lakh poultry birds.

Irrigation. The major and medium irrigation potential at the end of 1979-80 was 2.53 lakh hectaras supplemented by an equal potential of the minor irrigation. The first phase of the prestigious Rs. 61.61 Ravi -Tawi irrigation complex has been completed at a cost of Rs. 17.49 crores creating an irrigation potential of 12,880 hectares. Expenditure on the complex ending March, 1980 was Rs. 27.35 crores. The outlay for 1980-81 was Rs. 7 crores. The project is likely to be completed by the 6th plan, and creating a total potential of 28,000 hectares. One new major scheme namely Malali-Thang canal is proposed to be taken up during the 6th plan period. About 12 new major schemes are in progres.

Minerals. Coal and lignite are the chief minerals of the State. Bauxite, iron ore, copper ore, graphite, nickel, manganese, gold and gypsum are found in small quantities all over the State, Kashmir holds a virtual monopoly of sapphires, which are mined from the famous sapphire mines of Padder in Kishtwar.

Power. Kashmir possesses considerable hydel potential totalling 5000 MW of which 3000 MW has been identified and a large number of schemes formulated to harness it. The total installed capacity of power in the State has risen from 6.5 MW in 1947 to 138 MW at present.

The installed capacity has risen from 6.5 MW in 1947 to 208.78 MW. The number of villages electrified by 1979-80 end is 4633 against 2983 in 1976-77. The important power project under execution includes the Rs. 350-crore Salal Hydro Electric Project, undertaken by the Central Government. The project is designed to generate 345 MW of power. The Lower Jhelum Hydel project generates 105 MW. The Upper Sindh Project has a generating capacity of 22.6 MW. The work on Stakna Hydel Project in Ladakh (4 MW) is going on apace. The work on the Dool Hasti Project in Kishtwar is about to commence.

Industries. The State has come a long way in the industrial field since 1975 solely due to the efforts of the Government. Medium and small sector received emphasis as geographical constraints do not favour large scale industries. While preference is being given to the local entrepreneurs, industrialists from outside the state are encouraged for investment in areas where local entrepreneurship is not forthcoming.

Bari Bharamana Industrial Complex in Jammu, the biggest in the state, which had only two or three units three years back is humming with industrial activity today. The industries that have come up in the complex, sprawling 320 acres include a detergent plant of Hindustan Levers, a cigarette factory, a scooter factory. 2 pencil factories, a Joinery Mill, 2 Vanaspati mills, a precast cement factory and an annealed wire manufacturing unit.

The 600-ton-a-day capacity cement plant at Khrew is likely to go on steam shortly. A Rs. 6.50-crore spun silk project is also coming up.

In the small scale sector, the number of units registered has risen from 1039 in 1973-74 to 6386 in 1979-80. Their turnout has increased from Rs. 1162 lakhs to Rs. 6613.80 lakhs in the same period. These units provided direct employment to over 34,000 people in 1979-80.

The handicraft sector has witnessed remarkable progress. The handicraft production during 1980-81 touched Rs. 57.82 crores with carpets alone accounting for Rs. 27 crores. The massive handicrafts training programme started by the Government has thrown up an additional force of 24,000 artisans since 1976-77. The cooperative scheme in the handicraft sector has also registered discernible progress.

A separate Directorate of handlooms has been created for greater emphasis on the development of the handlooms sector.

Tourism. Tourism is the premier industry of the State. The tourist traffic has maintained a steady increase over the years. The number of tourists to the Valley in 1979-80 rose to over 5.53 lakh. This includes over 55,600 foreigners. This year, from January 1981 upto 5th May 1981 over 1.06 lakh tourists visited the Valley; of these over 9451 were from abroad. About 20,000 pilgrims visited the holy cave of Shri Amernath in the year 1980. The holy Shrine of Vaisheno Deviji in Katra attracted about 3.03 lakh pilgrims up to the 15th of May 1981.

A Convention Complex is coming up at the banks of the picturesque Dal Lake at a cost of Rs. 12 crores. This includes the cost of the hotel forming part of the Complex. The 275-room hotel with five-star amenities is being financed by the Hotel Corporation of India. The Complex is expected to give a big thrust to convention tourism in the Valley.

New spots, both in Jammu and Kashmir, are being developed for tourist interest. A number of scenic spots in Jammu have already been converted into tourist resorts. Phalgam and Gulmarg are being further developed under separate master plans. Winter tourists also receive high attention. A centrally heated hotel has been completed at Gulmarg for the comfort of the winter tourists. The outlay for this sector is Rs. 4.50 crores this year.

165. KARNATAKA

Karnataka is the eighth largest State in India both in area and population. It was formerly known as Mysore. On November 1, 1973 the name *Mysore was* changed to *Karnataka* under The Mysore State (Alteration of Name) Act 1973.

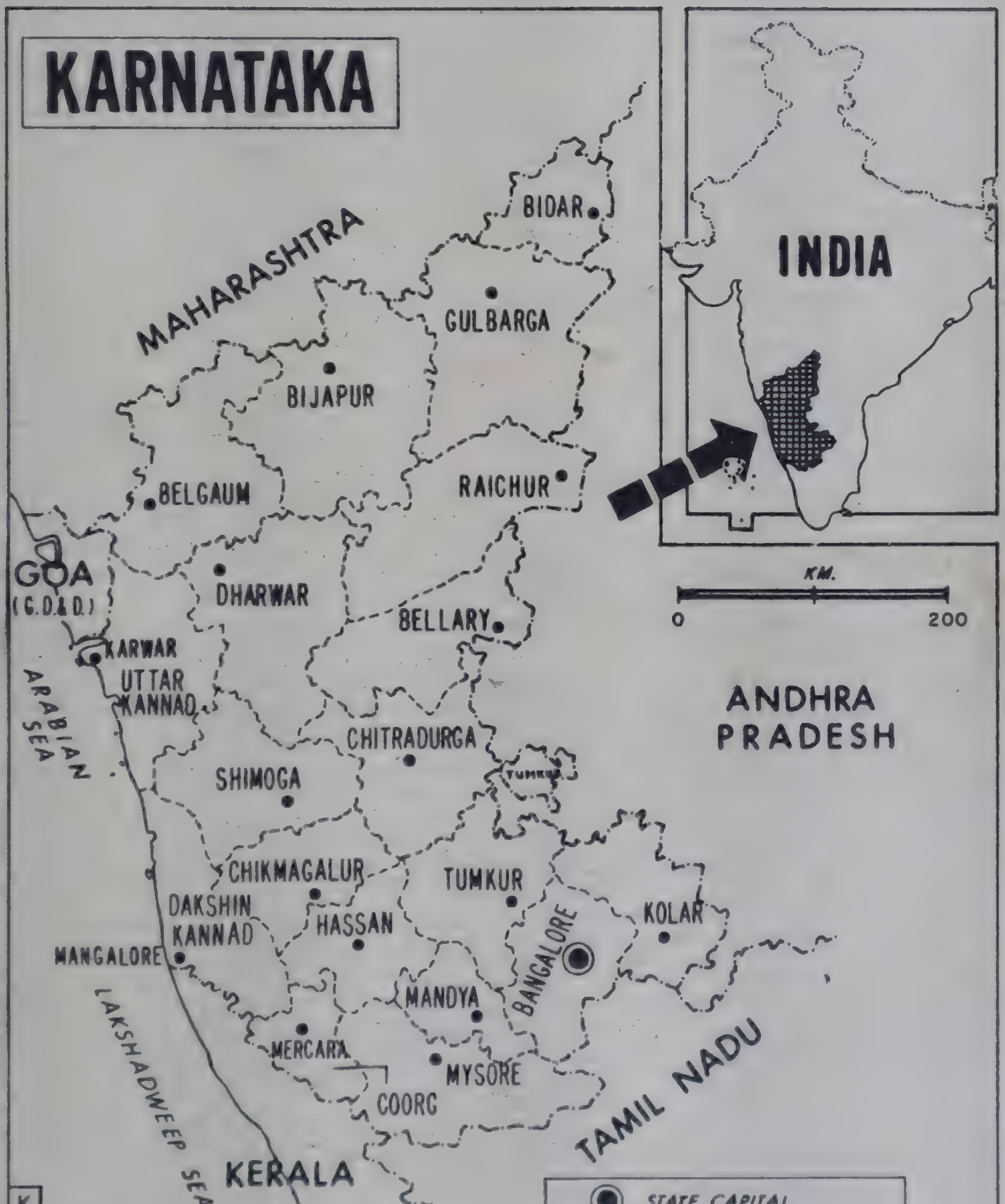
The change is much more than a change in nomenclature. It is the revival of a great image of a region which, under the name of Karnataka, had attained glorious heights in history.

Physiography. Karnataka is situated on the western edge of the Deccan plateau and has for its neighbours Maharashtra and Goa on the north, Andhra Pradesh on the east and T. Nadu and Kerala on the south. On the west, it opens out on the Arabian Sea.

Physiographically the State can be divided into four regions: (1) The Coastal Region, (2) the Malnad, (3) the Northern plains and (4) the Southern plains.

The coastal region, consisting of the western portions of North Kanara and South Kanara districts, is about 240 km wide between the Arabian Sea and the Western Ghats. The annual rainfall here is more than 250 cm (100 inches). The coastal plateau is covered with alluvium deposited by the short, turbulent rivers. The Malnad is the area lying east of the Western Ghats. It is about 150 metres above the sea level and consists of ranges of hills with an average height of 900 metres. It is characteristically a region of heavy rainfall (250 cm a year). The climate is generally hot and wet. The area is practically covered with thick evergreen forests.

The northern plains consist of the districts of Bidar, Bijapur, Raichur, Gulbarga and the eastern portions of Dharwar and Belgaum. The range of annual rainfall here is between 50 and 75 cm.



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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

The southern plains cover Bangalore, Kolar, Mandya, Tumkur and the eastern part of the Mysore District. This region presents a beautiful landscape, mainly because of the different types of vegetation that the land supports.

Rivers. The two important river systems of Karnataka State are the Krishna and its tributaries (Bhima, Ghataprabha, Malaprabha, Tungabhadra and Vedavati) in the north, and the Kaveri and its tributaries (Hemavati, Shimsha, Arkavati, Lakshmana Thirtha and Kabini) in the south.

Both these rivers flow eastward and fall into the Bay of Bengal, the Krishna passing through Andhra Pradesh and the Kaveri traversing Tamil Nadu.

A number of smaller rivers flow westward into the Arabian Sea. Of these Sharavati, Kalinadi and Netravati are important to Karnataka. They are being tapped for hydro-power.

As most of these rivers pass through other States notably Andhra Pradesh, Kerala and T. Nadu, there are frequent disputes as to water rights between Karnataka and the other States.

History. The name Karnataka is derived from Karunadu, literally, lofty land. As much of Karnataka is high plateau land, the name is entirely justified. The history of Karnataka goes back to the dim days of the epics. The capital of Bali and Sugreeva, 'monkey kings' of the Ramayana, is said to have been Hampi in Bellary district. Vatapi, associated with the Sage Agastya, is obviously Badami in Bijapur district.

In the 4th century B. C. Karnataka was part of the great Mauryan Empire. Siwamagiri (Kanakagiri in Raichur district) is said to have been the southern capital of the Mauryas. About 30 B.C. a local dynasty. Satavahana, came to power in Karnataka. The Satavahana Empire lasted nearly 300 years. With the disintegration of the Satavahana dynasty, the Kadambas came to power in the north, and the Gangas in the South. The gigantic monolithic statue of Gomateswara at Sravanabelagola is considered to be a monument of the Ganga period.

By the beginning of the sixth century A. D., the Chalukyas established a new empire in Karnataka. Pulikesan II carried Chalukyan arms into north India and defeated Harsha, the great emperor of the north. The Chalukyas were followed by the Rashtrakutas, who were dislodged by the Chalukyas, who again became the overlords of Karnataka. After the Chalukyan empire, the Yadavas of Devagiri and the Hoysalas of Dwarasamudra divided Karnataka between them.

In the 14th century, the great Vijayanagar empire was established. The Vijayanagar Empire dominated Deccan for about 200 years. As part of the Vijayanagar emprire Karnataka experienced days of prosperity and glory. A confederation of the Muslim sultans of the Deccan, destroyed the Vijayanagar Empire in 1565 (Battle of Talikota). The vast ruins at Hampi, near Hospet, remain to-day as sombre reminders of Vijayanagar glory.

In 1399 A. D. Yaduraya, the ruler of a small principality, Mysore, founded the Wodeyar dynasty. Raja Wodeyar (A. D. 1578—1612) enlarged the principality into a mighty kingdom, with Srirangapatanam as his capital. The Wodeyars were overthrown by Hyder Ali, the intrepid Muslim general of Mysore. With the defeat of Tippu, the son of Hyder Ali, by the British, the Wodeyars were restored to power as a feudatory of the British.

During British rule, the Karnataka area was distributed among the Princely States of Mysore, Hyderabad, and the British province of Bombay and Madras and the small principality of Coorg.

Formation of the State: The formation of the prsent State represents the fulfilment of the age-old aspirations of Kannada-speaking people to come together in a single State. The old Kingdom of Mysore formed the nucleus of this new State. Under the States Reorganisation Act, the Kingdom of Mysore gathered around itself in 1956 the districts of Kanara, Bijapur, Dharwar and the major portion of Belgaum district in the Gulbarga, Raichur and Bidar districts, from the princely State of Hyderabad, the South Kanara district (excluding Kasargod Taluk and Kollegal taluk in Coimbatore district) from the old Madras Presidency and the whole of the 'Part C' State of Coorg.

The Princely State of Mysore comprised the area that was restored to the original rulers by the British after the defeat and death of Tippu in 1799. The rulers of Mysore appear to have imbibed the great traditions of their ancient predecessors, the Cholas, the Chalukyas, and the Vijayanagar Empire. Fairly left alone by the British and guided by able administrators under responsible rulers, the State pioneered economic development on a planned basis. She led India in irrigation and power projects and in the field of public sector industrial undertakings. Economically, the State was in many ways well ahead of the rest of the country at the dawn of independence. However, it had several handicaps, in such matters as lack of a sea-board and ports of its own, and inadequate communication links in terms of railways. With the States Reorganisation in 1956, the State more than doubled its size and got a 150-mile seacoast as well as the rich forest wealth of Coorg and North Kanara and the rich mineral deposit areas of Bellary.

Administration. The Legislature is made up of two houses, the Legislative Assembly of 216 members and the Legislative Council of 63 members.

The State is divided into 19 districts.

Table 178

Area, Population and Headquarters of Districts (1981 Census)

(Provisional figures)

District	*Area in (Sq. km)*	*Population*	*Head-quarters*
Bangalore	8005	4921828	Bangalore
Belgaum	13415	2974861	Belgaum
Bellary	9885	1487062	Bellary
Bijapur	17069	2399124	Bijapur
Bidar	5,448	994106	Bidar
Chikmagalur	7201	908626	Chikmagalur
Chitradurga	10852	1774717	Chitradurga
Dakshina Kannada	8441	2373359	Mangalore
Dharwar	13738	2939988	Dharwar
Gulbarga	16224	2075368	Gulbarga
Hassan	6814	1351923	Hassan
Kodagu	4102	460164	Madikeri
Kolar	8223	1898984	Kolar
Mandya	4961	1414383	Mandya
Mysore	11954	2584878	Mysore
Raichur	14017	1779942	Raichur
Shimoga	10553	1657564	Shimoga
Tumkur	10598	1975331	Tumkur
Uttara Kannada	10291	1071243	Karwar

The economic structure of Karnataka is predominantly rural and agrarian. About 76 per cent of its population lives in rural areas while about 71 per cent of its working force is engaged in agriculture and allied activities which generate 49 per cent of the State income.

Agriculture is by far the most important sector of the economy as it contributes the most to the State income as also engages the bulk of its working force.

Major Crops. Among the food crops, Karnataka accounts for 47 per cent of the country's ragi production. The share of other crops in the country's production is: jowar—16 per cent, small millets—10 per cent, tur—9 per cent, maize—7 per cent and rice and bajra—5 per cent each.

Among non-food crops, coffee is the most important as it accounts for 59 per cent of the country's coffee production. Other crops with their share in India's production are: cardamom—49 per cent, arecanut—42 per cent, safflower—15 per cent, coconut—13 per cent, cotton and groundnut—10 per cent each, chillies and castorseed —8 per cent each and sugarcane and tobacco—6 per cent each.

Table 179

Major Crops, Area, Production and Productivity

Productivity (kg per hectare)

1980-81 (Final forecast figures)

Crop	*Area (in '000 hectares*	*Product-ion (in '000 tonnes*	*Karnataka*	*All India*
Food crops				
Rice	1085	2168	1999	1038
Jowar	1625	1397	859	672
Bajra	484	128	254	465
Maize	151	398	2634	1137
Ragi	910	988	1097	1052
Non-Food crops				
Groundnut	767	458	597	N.A
Cotton	961	506*	90	N.A
Sugarcane	155	12707	80†	57†

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* Thousand bales of 170 kg.

† in tonnes

Karnataka is one of the few states which has implemented a comprehensive land reforms programme. Till now 88,000 letters of occupancy rights have been issued to the landless. More than 84,000 applications with regard to the distribution of surplus lands have been disposed of. Surplus land has been distributed among the Scheduled Castes (1,33,300 acres) and Scheduled Tribes (78.000 acres).

Irrigation. As against an ultimate irrigation potential of 56 lakh hectares in the State, about 23 lakh hectares or 42 per cent was exploited by the end of 1979-80 (Table 180). The State is, however, poor in terms of utilisation of the potential created. Only 13.2 per cent of the State's net cultivated area receives irrigation as against 24.6 per cent for the country as a whole. The most important source of irrigation in Karnataka is canals which account for more than half the irrigated area. Next in importance are the wells (35 per cent).

Table 180
Irrigation Potential Created
(through major, medium and minor irrigation)

Year		*Area (Lakh Hectares)*
1973-74	....	15.94
1977-78	....	20.33
1978-79	....	21.95
1980-81	....	23.05
1981-82*	....	24.03

* Anticipated

Source: Government of Karnataka, Planning Department, Economic Survey 1979-80.

Animal Husbandry. The State is well developed in animal husbandry. A valuable by-product of animal husbandry is hides and skins. The estimated availability of raw hides and skins is around 12.5 lakh pieces (hides) and 29.6 lakh pieces(skins) which form 5.3 per cent and 6.3 per cent of hides and skins respectively of the total availability in the country.

The Karnataka Dairy Development Corporation is assisting the milk producers in marketing their products.

Livestock. According to the 1977 Livestock Census the total livestock in the State was about 207 lakhs consisting of about 100 lakh cattle, 31 lakh buffaloes, 41 lakh sheep, 31 lakh goats and four lakh other livestock. The total poultry population was 95 lakhs.

Forests occupy 18 per cent of the geographical area of the State. The concentration of forests is found mostly in the hilly regions of the western districts, viz., Belgaum, North Kanara, Shimoga, Chikmagalur, South Kanara, Coorg and Mysore districts.

The forests yield a variety of timbers like teak, rosewood, sandalwood and several species of softwood and bamboos. Among the minor forest produce, mention may be made of myrobalans, wattle-bark, rattan cane, ivory, honey etc. Of particular significance to the State is sandalwood oil which is extracted from sandalwood, and extensively used in soaps, chemicals and cosmetic industries.

Fisheries. Karnataka is the fourth important maritime State in India with more than 150 miles of coastline and a fishable area of about 10,000 square miles. The annual marine fish landings are estimated at 167,135 tonnes which form 10 per cent of the total fish landings in the country. The main varieties are oil sardines, mackerel, cod fish, sharks, prawns and shrimps.

During 1981-82 the Rs. 6.82-crore Indo-Danish Fisheries Project will be implemented at Tadri in North Kanara district. About 15,000 more tonnes of fish will be produced thereby benefitting 500 families of fishermen.

Sericulture. With about 5 per cent of the world's silk production in Indian hands, the State takes the fourth place in the world yielding the first three to Japan, China and Russia. Karnataka contributes today nearly 4 per cent of the world's mulberry silk and stands first in the entire country in regard to silk production.

Power. At the end of March 1981 the state had an installed capacity of 1469.8 mw. The total power generation in the state during 1980-81 was 6389 million Kwh. During 1980-81, the industrial sector accounted for the highest share (74.5 per cent) in the total power consumption followed by domestic sector (13.4 per cent) and agricultural sector (7.4 per cent).

The per capita power consumption in the state during 1980-81 was 156. In the sphere of rural electrification, out of a total of 26,826, villages, 21,803 or about 81 per cent were electrified at the end of March 1981.

Minerals. Karnataka is the home of a large number of minerals of economic importance. It contributes all the gold and silver produced in the country. The estimated reserves of high grade iron ore in the State are placed at 5000 million tonnes. These reserves are found mainly in the Chitradurga belt. The National Mineral Development Corporation of India has indicated that reserves of nearly 1000 million tonnes of magnesite, and iron ore with an iron content ranging from 25 to 40, have been found in Kudremukh Ganga-Mula region in Chikmagalur district. The estimated reserves of manganese in the State are well over 10 million tonnes.

Next to Orissa, Karnataka is the largest producer of chromite. It is one of the only two states of India producing magnesite, the other being T. Nadu. The other minerals of industrial importance are corundum, garnet, emery, asbestos, bauxite and clay.

Despite vast mineral resources, the utilisation of these minerals had not progressed to the desired extent over the past several years. The major factor responsible for this was the lack of mineral fuels, i.e., coal and oil.

The oldest among the mineral-based industries in Karnataka is gold mining in Kolar. Another important gold mining centre is Hutti in Raichur district. The companies undertaking gold mining are Bharat Gold Mines Ltd. and Hutti Gold Mines Co. Ltd. However, gold production is nominal and now does not exceed two tonnes a year.

Iron ore occupies an important position among the mineral resources of the State. The major steel plant in the State is Visveswaraya Iron & Steel Ltd. at Bhadravati in Shimoga District.

The Rs. 647-crore Kudremukh Iron Ore Project is the biggest mining project in the State. The entire cost of the project was provided by Iran. The project was commissioned on August 23, 1980 with the pumping of the first batch of 1100 tonnes of iron ore in slurry form through the 67-km long pipeline from Kudremukh to the Mangalore port. However, as Iran is no longer in a position to lift this iron ore the plant cannot go into full operation. Efforts are afoot to secure other overseas buyers for this iron ore.

Other mineral-based units in the State include Chitradurga Copper Co. Ltd., Mysore Minerals Ltd., National Mineral Development Corporation Ltd., Cement Corporation of India Ltd., Tungabhadra Steel Products Ltd. and Mysore Porcelains Ltd.

Industry. Karnataka has been one of the leading states in the country in respect of industrialisation. The favourable factors for industrialisation of the State are abundant forest and mineral resources of economic importance, vast hydro-power potential and skilled manpower. The growth rate of the industrial sector has been significant especially after 1970. The trends in production of different industries for the past several years have not been uniform. But, industrial output, as a whole, has shown a rising trend since 1970.

The State is dominated by the engineering industry which accounts for more than one-fifth of the working factories in the State and nearly two-fifths of the factory employment. Next in order of importance are the industries engaged in processing textiles and food products. The top six industries in Karnataka in terms of value of output are food products, electrical machinery, base metals and alloys, cotton textiles, electricity and paper. These six industries account for as much as 64 per cent of the value of output in the State.

Roads. The state has a well developed infrastructure buoyant enough to support a progressive economy. The total road length in the state at the end of March 1981 was 98,523 km which worked out to 51 km per 100 sq km of area.

Ports. The State has a coastal belt of 287 km covering North Kanara and South Kanara districts. Of the 19 ports in the State, the New Mangalore port is a major harbour and is under the administrative control of the New Mangalore Port Trust Board. The New Mangalore Port handled 8.74 lakh tonnes of cargo traffic during 1978-79. The remaining 18 ports under the administrative control of the State Government, on an average, handle about seven lakh tonnes of cargo, both foreign and coastal.

Education. Karnataka has a literacy percentage of 38 per cent. There were 40,905 schools (includes nursery, lower primary, higher primary & High) in 1980-81. There were five universities in the state namely, Bangalore, Mysore, Karnataka, Gulbarga and Mangalore and 465 colleges. There are two agricultural universities in the State.

Health. By the end of March 1982, there were 2027 hospitals (including dispensaries, primary health units, primary health centres) with a total bed strengh of 34,804. The number of beds per lakh population was nearly 94.

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Kerala Population: Final Figures

The population of Kerala, as per the final figures of the March 1981 census, is 25,453,860, the growth rate during 1971-81 being 19.24 per cent.

* * *

As on the census date, March 1, 1981 there were 12,527,767 males and 19,925,913 females, the sex ratio being 1000: 1032. Out of this population, 4,771,275 were urban inhabitants constituting 18.74 per cent, as compared to 16.24 in 1971.

Kerala's population went up from 5.219 million in 1881, to 25.454 million in 1981, registering an increase of 387.70 per cent.

The Hindu, Friday, Jan. 21, 1983.

166. KERALA

Kerala is a small state, tucked away in the south west corner of India. It has an area of 38,863 sq. km which represents only 1.03 per cent of the total area of India. But it supports a population of 25,403,217 which is 3.71 per cent of the total population of the country (1981). The disproportion between its area and population is reflected in the density—which in 1981 was 654 persons to the sq. km. This is the highest density among the States of the Union, higher densities being registered only by four Union Territories—Delhi-4178, Chandigarh—3948, Laccadive, Minicoy and Amindivi Islands, (now Lakshadweep)—1257 and Pondicherry—1228.

Physiography. Kerala may be divided into three geographical regions: (1) Highlands, (2) Midlands and (3) Lowlands. The Highlands slope down from the Western Ghats which rise to an average height of 3000 feet, with a number of peaks well over 6000 feet in height. This is the area of major plantations like tea, coffee, rubber, cardamom and other spices. The Midlands, lying between the mountains and the Lowlands, is made up of undulating hills and valleys. This is an area of intensive cultivation. Coconuts, arecanuts, tapioca, bananas, rice, ginger, pepper, sugar-cane and vegetables of different varieties are grown in this area. The Lowlands or the coastal area, which is made up of the river deltas, backwaters and the shore of the Arabian sea, is essentially a land of coconuts and rice. Fisheries and coir industry constitute the major industries of this area.

Rivers. Kerala is a land of rivers and backwaters. Forty-four rivers (41 west-flowing and 3 east-flowing) cut across Kerala with their innumerable tributaries and branches, but these rivers are comparatively small and being entirely monsoon-fed, practically turn into rivulets in summer, especially in the upper areas.

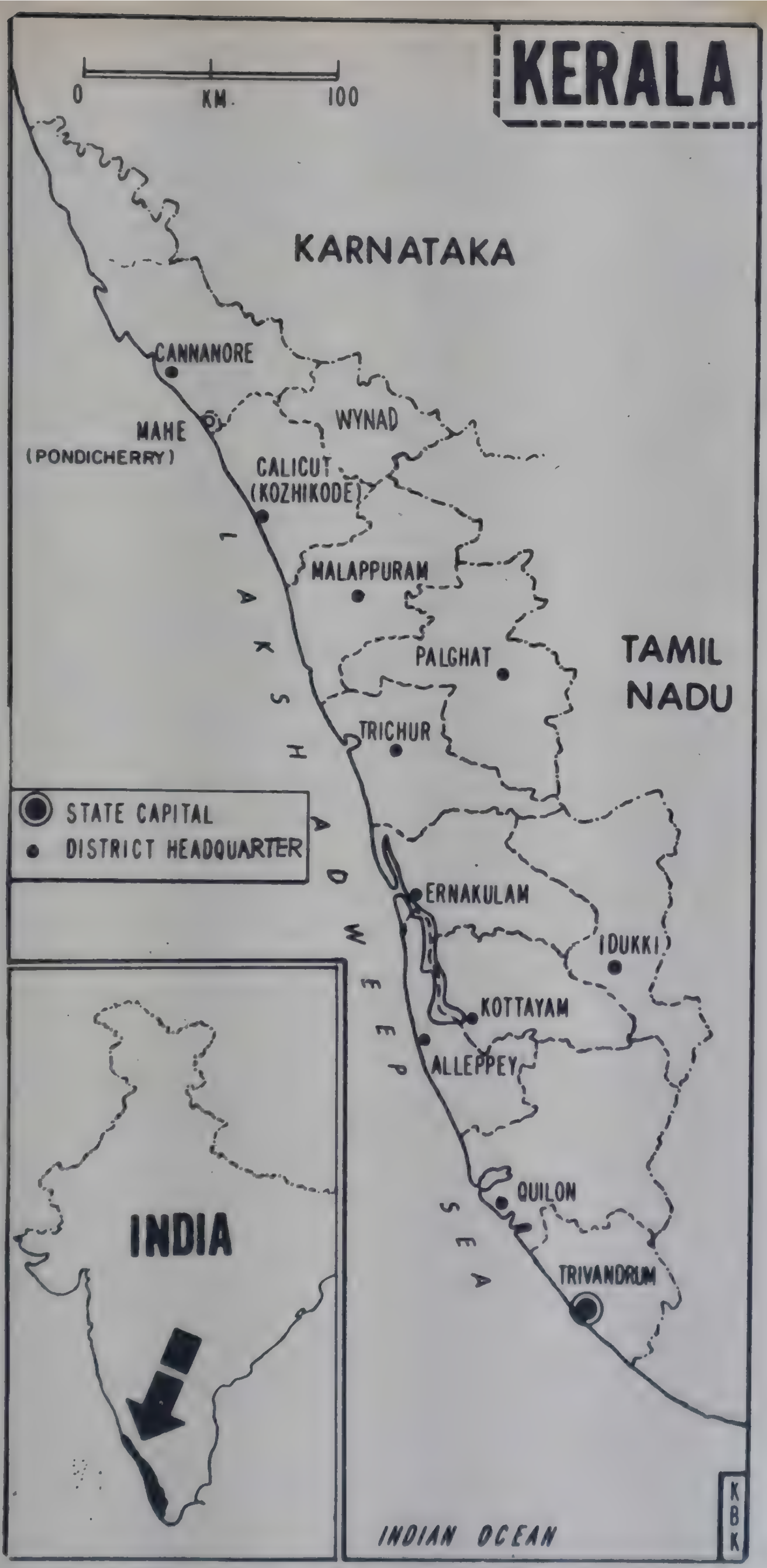
Backwaters. The backwaters form a specially attractive and economically valuable feature of Kerala. They include lakes and ocean inlets which stretch irregularly along the coast. The biggest backwater is the Vembanad lake, some 80 sq. miles in area, which opens out into the Arabian Sea at Cochin port. The Periyar, Pamba, Manimala, Achenkovil, Meenachil and Moovattupuzha rivers drain into this lake. The other important backwaters are Veli, Katinamkulam, Anjengo, Edava, Nadayara, Paravoor, Ashtamudi (Quilon), Kayamkulam, Kodungallore (Cranganore) and Chetuva. The deltas of the rivers interlink the backwaters and provide excellent water communications in the lowland of Kerala. A navigable canal, 228 miles long, stretches from Trivandrum, the capital of Kerala, to Tirur in the far north.

Formation of the State. When India became free, Kerala was made up of two princely States, Travancore and Cochin, and Malabar which was under the direct administration of the British. One of the first steps taken by independent India was to amalgamate small states together so as to make them viable administrative units. In pursuance of this policy the Travancore and Cochin States were integrated to form Travancore-Cochin State on1st July, 1949. But Malabar remained as part of the Madras Province. Under the States Re-organisation Act of 1956, Travancore-Cochin State and Malabar were united to form the State of Kerala on 1st November, 1956.

Some territorial adjustments had necessarily to be made on re-organisation. In this adjustment, Kerala lost to Madras (now Tamil Nadu) the taluks of Thovale, Agasteeswaram, Kalkulam and Vilavancode in the far south and Shencotta in the east, while it gained the Malabar district and the Kasargod taluk of South Kanara district in the north. The Laccadive, Minicoy and Amindivi islands lying off the coast of Malabar were detached from Kerala and declared as Union Territory.

On January 26, 1972 a new district Idukki was carved out of the old Ernakulam and Kottayam districts. It comprised the taluks of Devikulam, Udumpanchola and Peermade from the old Kottayam district and Thodupuzha taluk (excluding the villages of Manjallur and Kallurkad from the old Ernakulam district). Its permanent headquarters are located in the Idukki-Kulamavu complex, built around the Idukki hydel project. On 1st Nov. 1980, Wynad district was formed as the thirteenth district. Pathanamthitta was formed on 1st Nov. 1982 as the fourteenth district.

Kerala with its high population presents complex problems in the sphere of food employment and housing. The State is



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

Based upon Survey of India map with the permission of the Surveyor General of India
C Government of India Copyright 1979

50 per cent short of food. More than 13 lakh people, as on 30-4-1980, are educated and the number of the unemployed is 6.95 lakhs.

Population Growth. Kerala is the most densely populated State (Territories excluded) in India with a density of 654 persons to the sq. km in 1981. In such a densely populated state the growth of population has to be strictly controlled. As a result of the overall improvement in health care and the popularisation of family planning, the State has brought down the growth of population to 1.90 per cent per annum during 1971-81. This is the lowest growth rate in India and promises to keep the population stable in future years.

Administration. The legislature consists of only one house, the Legislative Assembly.

The State is divided into the following districts:

Table 181

District	*Area in sq. km.*	*Population (1981)*	*Head-quarters*
Cannanore	4958	2800055	Cannanore
Wynad†	2126	553348	Kottappadi
Kozhikode	2314	2243004	Kozhikode
Malappuram	3674	2401229	Malappuram
Palghat	4392	2041912	Palghat
Trichur	3031	2436975	Trichur
Ernakulam	2408	2533265	Ernakulam
Idukki	5061	971193	Painave
Kottayam	2204	1681104	Kottayam
Alleppey	1883	2342852	Alleppey
Pathanamthitta*	—	—	Pathanamthitta
Quilon	4620	2807223	Quilon
Trivandrum	2192	2591057	Trivandrum
Total Kerala	38863	25403217	

† Wynad was formed on 1st Nov. 1980

* Pathanamthitta was formed on 1st Nov. 1982.

Agriculture. Owing to historical and climatic reasons the State has developed commercial agriculture more than food crops. Consequently, the State is short of foodgrains, especially rice which is the staple food of the people.

Kerala has a unique cropping pattern. It accounts for 92 per cent of India's rubber, 70 per cent of cardamom, 70 per cent of coconut, 60 per cent of arecanut, 70 per cent of pepper, 80 per cent of tapioca and almost 100 per cent of lemon grass oil. Kerala is the single largest producer of a lot of other crops like bananas and ginger, besides tea and coffee in abundance.

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Kerala's Seesaw Politics

Nov. 1, 1956: Birth of Kerala.
Mar. 1957: First Assembly election.
April 5, 1957: E. M. S. ministry (Communist) sworn in.
July 31, 1959: E. M. S. ministry dismissed.
Feb. 1960. Election to the Assembly.
Feb. 22, 1960: Pattom Thanu Pillai ministry sworn in (Congress).
Sept. 25, 1962. Pattom appointed Governor of Punjab.
Sept. 26, 1962: R. Sankar ministry sworn in (Congress).
Sept. 10, 1964: Sankar ministry goes.
Mar. 1965: Assembly election (infructuous).
Feb. 1967: Election to the Assembly.
Mar. 6, 1967: Second E.M.S. ministry sworn in (Communist).
Oct. 24, 1969: E.M.S. ministry goes.
Nov. 1, 1969: Achutha Menon ministry in (Left United Front).
June 26, 1970: Assembly dissolved.
Aug. 1, 1970: Achutha Menon ministry resigns.
Sept. 1970: Assembly Election.
Oct. 4, 1970: Second Achutha Menon ministry in.
Mar. 1977: Election to the Assembly.
Mar. 25, 1977: Karunakaran ministry sworn in (Congress).
April 25, 1977: Karunakaran resigns.
April 27, 1977: A. K. Antony sworn in Chief Minister (Congress).
Oct. 27, 1978: Antony resigns.
Oct. 29, 1978: P. K. Vasudevan Nair ministry sworn in (Left United Front).
Oct. 7, 1979: Vasudevan Nair goes.
Oct. 11, 1979: C.H. Mohammed Koya ministry sworn in (Right United Front).
Dec. 1, 1979: Mohammed Koya goes.
Jan. 1980: Election to the Assembly.
Jan. 25, 1980: E. K. Nayanar ministry sworn in (Left United Front).
Oct. 20, 1981: Nayanar ministry goes.
Dec. 28, 1981: Karunakaran ministry sworn in (United Democratic Front).
Mar. 17, 1982: Karunakaran ministry resigns.
May 19, 1982: Assembly Election.
May 24, 1982: Karunakaran ministry sworn in (United Democratic Front).

There has been a marginal setback in the production index of all crops during 1980-81 owing to a decline in production both in the foodgrains and non-foodgrains sectors. The redeeming feature is that the new emphasis given to various progrmmes adopted for the development of pulses has boosted the production and productivity of this crop. Crop production in 1980-81 presents a different picture as compared to the previous year. Rice production registered a fall of 2 per cent. The overall rice production in 1980-81 was 12.72 lakh tonnes. The highest decline in production is seen recorded under tea in the plantation sector followed by cardamom, sesamum and pepper. However, it is encouraging to note that crops like coconut, arecanut, cashewnut, banana and plantations, sugarcane, ginger, sweet potato, groundnut, etc. which recorded a decline in production during 1979-80 have all registered increases in production during 1980-81. The food situation in the State was less comfortable in 1981 compared to the previous year. The per capita availability of foodgrains declined from 312 grams per day in 1980 to 298 grams per day in 1981. Not only was the internal production of rice low but the imports of both rice and wheat into the State were also less during 1981. Though there was free flow of rice on private account, this could not ease the supply position in the slack season when the price of rice in the open market was high. But official distribution agencies including the Civil Supplies Corporation effectively intervened in the distribution of foodgrains to hold the price line in check.

The network of public distribution system put up a commendable performance in 1981. Though the number of wholesale shops remained static at 265, that of retail shops increased from 10,875 to 11,471. There was appreciable increase in the quantum of kerosene oil and sugar distributed through these outlets during the year. The Kerala State Civil Supplies Corporation could also positively influence the market especially during seasons of the festivals like Onam and Christmas when market prices show a general tendency to soar high.

Plantation Crops. Rubber: Production of natural rubber recorded an increase during 1980-81. From 148,470 tonnes in 1979-80, it went upto 153,100 tonnes in 1980-81 in Kerala registering an increase of 3 per cent. Productivity has registered the same trend of increase at State and National levels. Kerala accounts for 91 per cent of the total area and 92 per cent of the total production of natural rubber in India. The import of natural rubber has come down compared to the previous year. The consumption of natural rubber in the country has risen by 5 per cent between the years 1979-80 and 1980-81 while the rise was only 0.4 per cent between the years 1978 79 and 1979-80.

The upward trend in the price of natural rubber in the market has triggered large scale expansion of rubber cultivation in different parts of the country. However, the indigenous production of natural rubber has not been able to meet the demand in full. Therefore the Rubber Board has introduced a new subsidy-cum-credit scheme known as "Rubber Plantation Development Scheme" during the year 1980-81 with a total target of 60,000 hectares over the sixth plan period.

Coffee. Coffee cultivation in the country is mainly confined to three southern states viz., Karnataka, Kerala & Tamilnadu. Karnataka accounts for 53.73%, Kerala 28.82% and Tamilnadu 15.62%. The total area under this crop, according to the Coffee Board, is 2 lakh hectares.

Coffee plantations registered a production of 1.5 lakh tonnes at the national level during 1981-82. Kerala's share was 33,025 tonnes (1981-82) against 26,975 during the previous year (1980-81). The total area under this crop during the period was 57,564 hectares.

Tea. Kerala accounts for about ten per cent of the area under tea in the country. Contrary to the upward trend of increasing area at the national level, the crop area in Kerala has been revealing a declining trend. Up to 1964, there was an increasing trend reaching a level of 39,958 hect. Thereafter a steady declining trend is being noticed. In 1980, the area under tea in Kerala was 36,125 hectares.

Tea production in the State recorded a steady increase from 42,161 tonnes in 1974 to 53,614 tonnes in 1980. However, the production in 1981 was only 47631 tonnes.

Cardamom. Cardamom cultivation in India is concentrated in the southern states of Kerala, Karnataka and Tamilnadu. Among these, Kerala accounts for the major share. The estimated area under cardamom in India is 93,947 ha. out of which 56376 ha. (60 per cent) is in Kerala, 28,223 ha. (30 per cent) in Karnataka and 9348 ha. (10 per cent) in Tamilnadu. The production of cardamom during 1979-80 was 4500 metric tonnes as against 4000 metric tonnes in the previous year. The production in 1980-81 was 4400 metric tonnes which again came down to the level of 4000 metric tonnes during 1981-82.

Cardamom earned Rs. 301 million on export account (2319 metric tonnes during 1981-82) according to provisional figures available. Corresponding figures for the previous year were 346 million and 2345 metric tonnes respectively. The maximum earnings from cardamom in the past was Rs. 584 million by the export of 2876 metric tonnes in 1978-79. The unit export price was also the highest in 1978-79, i.e., Rs. 203 per kg. In the succeeding years it was Rs. 184, Rs. 148 and Rs. 134 per kg respectively.

Animal Husbandry. Animal husbandry sector contributes 1.5 per cent of the regional income of this State. As per the 1977 Livestock Census, Kerala, the livestock population of the State was 53.19 lakhs. This comprises 30.06 lakh cattle, 4.54 lakh buffaloes, 16.83 lakh goats, 0.03 lakh sheep and 1.72 lakh pigs. The poultry population, according to the census, was 133.89 lakhs.

Kerala is considerably ahead of other Indian States in providing cross breeding facilities to cows using semen of exotic breeds. During 1981-82 a total of 10 lakh artificial inseminations were done to cows in the state. According to census estimates, 50.02 per cent of the breedable cows have become cross-breds as a result of the massive cross breding activities taken up in the state.

The total estimated milk production in the state during 1980-81 was 9.08 lakh tonnes and the per capita per diem availability of milk has risen to 98 grams (1980-81).

Estimates of egg production show that 962 million eggs were produced during 1980-81 in the state which works out to a per capita availability of 38 eggs (per year).

Irrigation. The total extent of land that can be brought under irrigation in Kerala through major and medium irrigation projects is estimated at 6 lakh hectares (net) or 14 lakh hectares (gross). During the year 1980-81 alone 15,508 hectares (gross) were added to the irrigated area by the partial commissioning of some of the on-going projects.

Forests. Total notified area under forests as on 31-3-1981 was 11229.120 square kilometres, which formed 29 per cent of the geographical area of the state. Out of the above area the State Forest constituted 9335.937 square Km (83.14 per cent) while the vested forests (now vested with the government) comprised the rest, that is, 1893.183 sq. km (16.86 per cent). Total area under forest plantations till the end of March 1981 was 1.43 lakh hectares, covering 12.75 per cent of the aggregate area under forests in Kerala.

Fisheries. About 3.13 per cent of the State's total population is engaged in the fisheries sector. The aggregate fish production in the State has come down from 3.56 lakh tonnes in 1979-80 to 3.05 lakh tonnes in 1980-81 registering a decrease of nearly 16 per cent. The value of marine products exports from Kerala was only Rs. 95.34 crores in 1980-81 compared to the previous year's figure of Rs. 103.93 crores signifying a fall of 8.2 per cent over the year.

Power. Though the rivers of Kerala are very small, they offer great scope for hydroelectric projects. It is estimated that about six per cent of India's total hydroelectric potential is in this State. Kerala has a power potential of 3 million kilowatts of Hydel power at 60 per cent load factor. So far the State has harnessed only one-third (1011.5 MW) of this potential through eleven completed projects.

The Planning Commission has approved the 15 MW (53 MU per annum) Kallada Power Station in Sept. 1981 and work on this scheme has also been commenced. A total number of 2.56 lakh service connections were provided, 41,454 street lights were installed, 14,120 pump sets were energised and 271 Harijan and tribal colonies were provided with electricity during 1980-81.

The total energy generated during the year 1981-82 is 5540 MU. The energy consumption within the State for 1981-82 is 2734.45 million units.

Rural Electrification. Even though all the villages in the State had been provided with electricity distribution lines by 1979-80, electricity is still to reach several parts of the villages. During the year 1981 special efforts were made to take electricity to all parts in the State as far as possible.

The total number of consumers as at the end of 1981-82 is 1,843,351.

Minerals. The Mineral Development and Mining Lease Division during the year has conducted 122 site inspections for issuing N. O. C. and Inspections in 144 mines of major minerals and in 337 quarries for minor minerals. Arrangements have been made for conducting detailed feasibility study on bauxite in Nileshwar area by HINDALCO. The Mining and Geology Department conducted geological investigation along the foot-hills of the Western Ghats in Trivandrum district.

Industry. As a result of the package of incentives announced by the State Government and the concerted efforts of the industrial promotional agencies in the State like Kerala State Industrial Development Corporation, Kerala Financial Corporation and Small Industries Development and Employment Corporation, the Industrial scene of Kerala has started showing certain positive changes. Of the ten important Government majority concerns, three companies Chalakkudy, Pallathra Bricks and Tiles and Travancore Sugar and Chemicals, suffered losses in 1980-81 while seven were running on profit. The traditional industries of the State including handloom, coir and cashew continued to be hampered by the usual problems such as shortages of raw materials, poor market, low technology and severe underemployment. Nonavailability of raw husk in adequate quantities to provide full employment to the large work force in coir industry is the major problem in that sector. Shortage of raw nuts continued to be the major problem affecting cashew industry. The indigenous and imported nuts together could provide employment to the cashew workers for only about 2 months in the year. Problems like soaring prices of raw materials, accumulation of unsold stock and competition from the organised mill sector continue to persist in handloom industry.

Employment. The number of applicants remaining on the Live Register of various Employment Exchanges in the State and their breakup as on 31-3-81 and 31-3-82 are given in the following table:

Table 182

		No. as on		*Increase*	
		31-3-81	*31-3-82*	*No.*	*%*
I.	No. of Employment Exchanges in Kerala.	24	28	4	—
II.	No. of applicants on the Live Register of various Employment Exchanges in the State	1651358	1895755	+244397	14.79
III.	a) Breakup by Sex				
	i Male	993571	1104721	+111150	11.18
	ii Women	657787	791034	+133247	20.25
	iii Total	1651358	1895755	+244397	14.79
	b) Breakup by educational level				
	i Matriculate	655646	752251	+ 96605	14.73
	ii Higher secondary/PDC	83349	91577	+ 8228	9.87
	iii Graduates and above	75863	83565	+ 7702	10.15
	iv in engineering	1384	1232	— 152	10.98
	v in medicine	615	681	+ 66	10.73
	vi Non-Matric and Illiterates	832502	964533	+132031	15.85
	vii Total	1651358	1895755	+244397	14.79

Placement activities. The number of vacancies notified to various Employment Exchanges in the State and number of candidates placed in employment during the years ended 31-3-81 and 31-3-82 are given in the following table.

Table 183

	No. during the year ended		*Change*	
	31-3-81	*31-3-82*	*No. (+/−)*	*%*
Vacancies notified	33855	31449	—2406	7.10
Placements	21641	19176	—2465	11.39

Communication. Roads. The total length of roads in Kerala is about 94,000 km which works out to 37 km per 10,000 population. Of this about 172,000 km are maintained by the State Public Works Department and 840 km are National Highways. Though the State has a comparatively well developed network of roads, the dust-free surface of roads is only about 20 per cent as compared to about 40 per cent at the national level.

The number of motor vehicles registered in the State moved from 1.75 lakhs in 1979-80 to 1.95 lakhs in 1980-81, an increase of 11.4 per cent. The density of motor vehicles in Kerala is high compared to most of the States in India. Kerala had 500 vehicles per 100 sq. km of area and 766 vehicles per lakh of population (1980-81). The corresponding figures for all India during 1977-78 were 99 and 508 respectively.

Inland Waterways. Inland navigation has an important role in the transport system of Kerala. The State has a length of about 1900 km of navigable waterways. During 1980-81, State Water Transport Department operated boat services in 68 routes covering a gross route distance of 7400 km.

Railways. The railway network in Kerala consists of 803.64 km of broadgauge lines and 112.71 km of metregauge lines. The Ernakulam-Alleppey broadgauge line is under construction.

Air Transport. Air Transport Services in the State are operated from the two air ports of Trivandrum and Cochin. During 1980-81 a total of about 3.8 lakh passengers were carried from these two airports compared to about 3.6 lakhs during 1979-80.

Ports. Kerala has a major port at Cochin, three intermediate ports at Calicut, Alleppey and Neendakara and eleven minor ports.

Telecommunication. Kerala has at present 3 Postal Regions, viz., Trivandrum Region, Cochin Region and Calicut Region, 23 Postal Divisions, 3 RMS Divisions, 3 Postal Stores Depot Units, One Stamp Depot and One Mail Motor Service Division.

As on 30-9-1982, 4646 Post Offices are functioning in the State of which 51 are Head Post Offices, 2102 Sub Post Offices and 2493 Branch Post Offices. The average area served by a Post Office is 8.36 sq. km against the all-India average of 25 sq.km. The population served by a Post Office in Kerala averages 5468 persons.

Table 184

No. of Telephone Exchanges as on 31-8-1982	495
Equipped Capacity	121,110
No. of working Telephones	109,531
No. of Trunk exchanges	66
No. of Telex exchanges	9
No. of Telex connections	912
No. of Dist. Hqrs. provided with STD facilities	9

Literacy and Education. The literacy in Kerala has increased from 60.42 per cent in 1971 to 69.17 per cent in 1981. The enrolment ratio in the age group 6-11 has almost attained 100 per cent.

Table 185

No. of Schools 1980-81

	Govt.	*Pvt.*	*Total*
High Schools	789	1187	1976
U. P. Schools	867	1886	2753
L. P. Schools	2712	4149	6861
Training Schools	30	62	92

In addition to the above, there are 7 Anglo-Indian High Schools, 1 Anglo-Indian U. P. School and 1 Anglo-Indian Training School in the State.

Enrolment 1980-81 (in lakhs)

	Boys	*Girls*	*Total*
L. P. Section	13.33	12.62	25.95
U. P. Section	8.84	8.10	16.94
High School Section	6.79	6.34	13.13
Total	28.36	27.06	56.02

Table 186

No. of Colleges

No. of Arts and Science Colleges in Govt. Sector	38
No. of Arts and Science Colleges in Private Sector	123
No. of Training Colleges in the Govt. Sector	4
No. of Training Colleges in the Private Sector	15
No. of Physical Education Colleges in Govt. Sector	1
No. of Music Colleges in Govt. Sector	3
No. of Arabic Colleges	6

Student Strength during 1981-82 (Provisional)

Course	*Sector*	*Boys*	*Girls*	*Total*
Pre-Degree	Government	15154	11444	26598
	Private	68275	68423	136698
Total		83429	79867	163296
Degree	Government	8709	6155	14864
	Private	37415	40972	78387
Total		46124	47127	93251
Post Graduate	Government	863	1127	1990
	Private	2593	2135	4728
Total		3456	3262	6718

60

Kerala in the 1981 Census

Kerala claims the highest literacy rate, the highest sex ratio and the second lowest growth rate of population among the States in the country.

According to the provisional population figures released by Mr. M. Vijayanunni Nambiar, Director of Census Operations, Kerala's population is 2.54 crores, consisting of 1.24 crore males and 1.29 crore females. The decadal growth rate is 19 per cent, compared to 26.29 per cent in 1961-71. Tamil Nadu with 17.23 per cent claims the lowest growth rate in the country, while Nagaland has as high a rate as 49.73 and Assam 36.09.

Comparative figures of Kerala in the census since the formation of Kerala State.

	1961	*1971*	*1981*
Population Total:	16,903,715	21,347,375	25,403,217
Males:	8,361,927	10,587,851	12,487,961
Females:	8,541,788	10,759,524	12,915,256
Decadal population growth rate:	24.76 *(1951-61)*	26.29 *(1961-71)*	19.00 *(1971-81)*
Density of population (persons per sq. km):	435	549	654
Sex ratio (females per 1000 males):	1022	1016	1034
Literacy rate Total:	46.85	60.42	69.17
Males:	54.97	66.62	74.03
Females:	38.90	54.31	64.48

Health. As on 1-4-1981, there were 1810 sub-centres functioning in the State. There were 55 Taluk Hospitals, 165 Primary Health Centres, 595 rural dispensaries and 4 Government and 9 Private A.N.M. Training Schools in the State with an admission capacity of 290. The number of beds in the medical institutions in the State increased from 30,220 in 1979-80 to 32,447 in 1980-81.

Tourism. Provided with excellent natural beaches and hill resorts, Kerala is gaining importance in the world map of tourism. The Kerala Tourism Development Corporation is mainly engaged in the establishment and running of hotels which form one of the basic infrastructure for the development of Tourism.

167. MADHYA PRADESH

Situated in the Centre of India and bounded on all sides by other Indian States, Madhya Pradesh (Central Province) is entirely justified in its name. It is the biggest State in India and was created on November 1, 1956 out of the former States, then known as Madhya Bharat, Vindhya Pradesh and Bhopal and 14 Mahakoshal districts of the old Central Province under the British.

Physiography. Except for the valleys of the Narmada and the Tapti, M. P. consists of a plateau with a mean elevation of 1600 ft. above sea level, interspersed with the mountains of the Vindhya and the Satpura ranges. The main river systems are the Chambal, Betwa, Sindh, Narmada, Tapti, Mahanadi and Indravati.

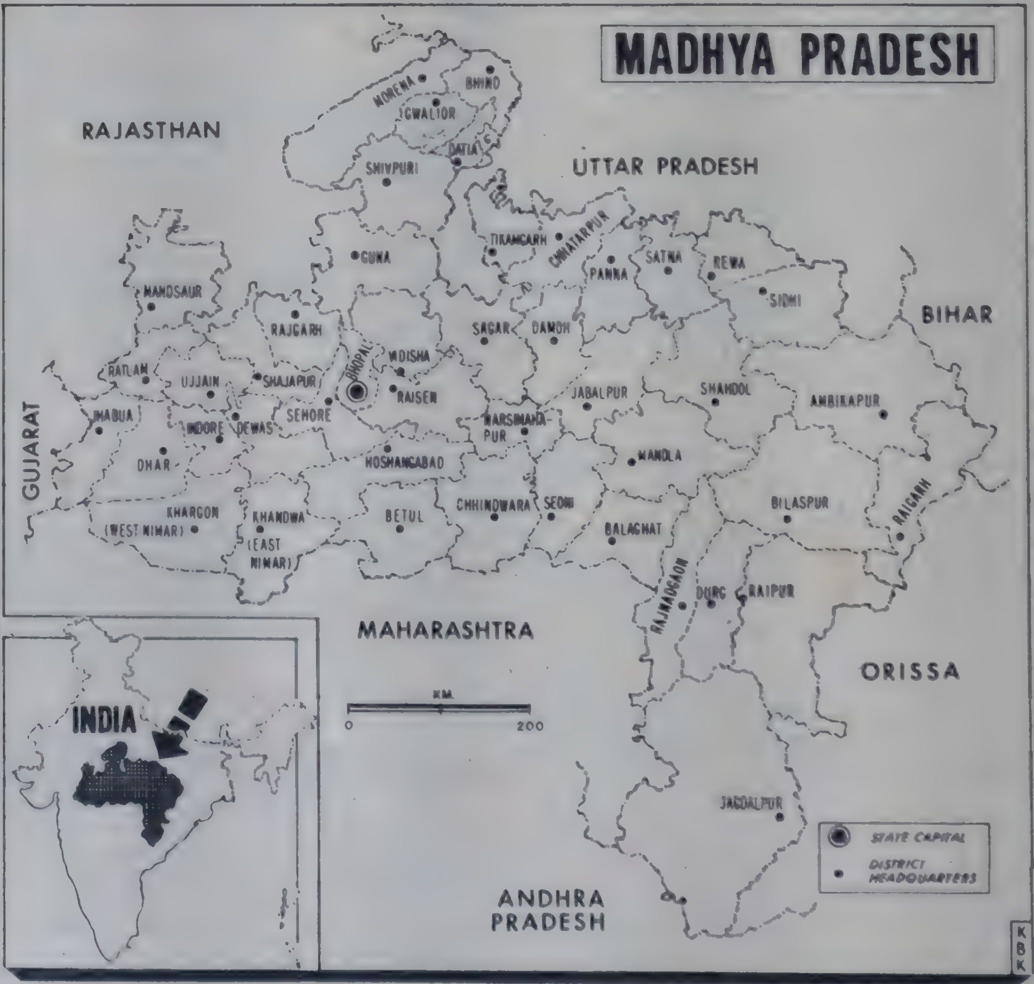
The average rainfall in the different regions of the State ranges from 30 to 60 inches. The climate is extreme in the north, temperate and breezy in the plateau and generally hot and humid in the eastern and southern plains. Nearly a third of the State's area is covered with tropical forests.

M. P. has the largest population of Scheduled Tribes of all States and a high proportion of Scheduled Castes. Together, they constitute nearly one-third of the population. While Scheduled Castes have benefitted to some extent by the progress of the State, the Scheduled Tribes have practically remained unaffected. These tribes are concentrated in Bastar district at the extreme south of M.P. The uplift of the tribals in the district mainly depends on the progress of this area.

Administration. The Legislature is unicameral with one house—the Legislative Assembly. The State is divided into 45 districts.

Table 187

District	*Area (sq. km)*	*Population (1981 census)*	*Headquarters*
Balaghat	9229	1147719	Balaghat
Bastar	39114	1840449	Jagdalpur
Betul	10043	924215	Betul
Bhind	4459	969920	Bhind
Bhopal	2772	895815	Bhopal
Bilaspur	19897	2952086	Bilaspur
Chhatarpur	8687	885843	Chhatarpur
Chhindwara	11815	1232735	Chhindwara
Damoh	7306	721107	Damoh
Datia	2038	311640	Datia
Dewas	7020	794446	Dewas
Dhar	8153	1055826	Dhar
Durg	8537	1889929	Durg
East Nimar	10779	1154830	Khandwa
Guna	11065	997025	Guna
Gwalior	5214	1111145	Gwalior
Indore	3898	1405904	Indore
Hoshangabad	10037	1003291	Hoshangabad
Jabalpur	10160	2199138	Jabalpur
Jhabua	6782	795834	Jhabua
Mandla	12269	1036134	Mandla
Mandsaur	9791	1262410	Mandsaur
Morena	11594	1301254	Morena
Narsingpur	5133	649701	Narsinghpur
Panna	7135	539864	Panna
Raigarh	12924	1442041	Raigarh
Raipur	21258	3075430	Raipur
Raisen	8466	708973	Raisen
Rajnandgaon	11127	1166475	Rajnandgaon
Ratlam	4861	783384	Ratlam
Rewa	6134	1205526	Rewa
Sagar	10252	1321918	Sagar



Satna	7502	1152209	Satna
Sehore	6578	656982	Sehore
Seoni	8758	809502	Seoni
Shahdol	14028	1343917	Shahdol
Shajapur	6196	840093	Shajapur
Shivpuri	10278	865386	Shivpuri
Sidhi	10226	988929	Sidhi
Surguja	22337	1631075	Ambikapur
Tikamgarh	5048	736512	Tikamgarh
Ujjain	6091	1116270	Ujjain
Vidisha	7371	783349	Vidisha
West Nimar	13450	1630682	Khargone

Economic Structure. Madhya Pradesh is the largest state in terms of area. Nature has bestowed on it vast agricultural, mineral and industrial resources. The land -man ratio is one of the lowest. The State though rich in resources has remained poor. The aggregate industrial production is still small compared to the available potential. Because of the lack of irrigation, the per acre agricultural production is poorer than the national average.

Agriculture is the mainstay of the State's economy and 83 per cent of the people are rural. Over 42 per cent of the land area is cultivable of which 12.3 per cent is under irrigation. The Malwa region abounds in rich black cotton soil, the low lying areas of Gwalior, Bundelkhand, Baghelkhand and Chhatisgarh plain have a lighter soil while the Narmada valley is formed of deep rich alluvial deposits. Production of principal crops in 1978-79 (in '000 tonnes) was: Food grains 11,641, Sugarcane 17900, Cotton bales 29700 (170 Kg each), oilseeds 55400.

Irrigation. The irrigation potential in the State for the pre-plan period (prior to 1950-51) was 4.6 lakh ha. from 2 major, 18 medium and 618 minor schemes. This increased to 17.7 lakh ha. from 12 major, 81 medium and 3716 minor schemes at the end of the Fifth Plan 1978-79. By adding irrigation potential of 1.4 lakh ha. created during 1979-80, the total irrigation potential created from the Government sources in the State went upto 19.1 lakh ha. The irrigation from all sources ending 1979-80 reached 30.85 lakh ha. Additional potential of 1.6 lakh ha. is likely to be created during 1980-81 and the target for 1981-82 is 1.65 lakh ha. from Government sources only.

Livestock. (1977 Census) Cattle: 26,253,226; Buffaloes: 5,844,850; Sheep: 967,668; Goats: 6,724,942; Pigs: 360,684; Camels: 12,039; Others 47,994 and Poultry: 7,156,560.

Forestry. 155,441 sq. km or roughly 35 per cent of the total land area of Madhya Pradesh is covered by forests. The major forest species are teak, sal, saja, bija and bamboo. Forests of the State not only provide timber for industrial and commercial uses, but protect major watersheds of the country, maintain ecological balance and meet roughly 60% of domestic energy requirement in the form of firewood.

Minerals. The State has mineral deposits including coal, iron, ore, manganese, bauxite, ocher, sillimanite, limestone, dolomite, rock phosphate, copper ore, barytes, china clary, fire clay, corundum, diamond, pyrophyllite, diaspore, lepidolite, asbestos, vermiculite, glass sand, quartz, fělspars and bentonite.

In 1980 the output of major minerals was (in million tonnes) coal 25.10, iron ore 9.70, limestone 6.53, dolomite 0.77, rock phosphate 0.10, bauxite 0.47, manganese ore 0.27 and diamond 14432 carat. The value of mineral production during 1980 was Rs. 3626 million.

Power (Electricity). Madhya Pradesh is rich in low grade coal suitable for power generation and also has immense potential hydro electric energy. The present installed capacity is 1630.5 mw of which 193 mw. is from hydro-electric power stations. The thermal power stations are at Korba in Bilaspur district, Amarkantak in Shahdol district and Satpura in Betul district. New stations are being built. The only hydro-electric power station is at Gandhi Sagar Lake in Mandsaur district, this with a maximum water surface of 165 sq miles is the biggest man-made lake in Asia.

Industry. The major industries are the steel plant at Bhilai. Bharat Heavy Electricals at Bhopal, the Aluminium Plant at Korba, the Security Pagar Mills at Hoshangabad, the Bank Note Press at Dewas, the Newsprint Mill at Nepanagar and Alkaloid Factory at Neemuch, Cement Factories, Vehicle Factory, Ordnance factory and Guncarriage Factory. There are also 23 textile mills, 7 of them nationalised.

The Bhilai Steel Plant near Durg is one of the six major steel mills. A power station at Korba (Bilaspur) with a capacity of 420 MW serves Bhilai, the Aluminium Plant and the Korba Coalfields.

The Heavy Electricals Factory was set up by the Government of India at Bhopal during the Second Plan period. This is India's first heavy electrical equipment factory and also one of the largest of its type in Asia. It makes a variety of highly complicated equipment required for generation, transmission, distribution and utilization of electric power.

Other industries include cement, sugar, straw board, pulp and paper straw board, vegetable oil, refractories, potteries, textile machinery, wood products, leather goods, steel casting and re-rolling, chemical fertilizers, industrial gases, synthetic fibres, drugs, biscuit manufacturing, engineering tools, rayon and art silk.

The number of small scale industries in production is 77361. Thirty-nine out of 45 districts in the State are categorized as industrially backward districts.

The main industrial development agencies are Madhya Pradesh Financial Corporation, Madhya Pradesh Audyogik Vikas Nigam Ltd., Madhya Pradesh State Industries Corporation, Madhya Pradesh Laghu Udyog Nigam, Madhya Pradesh State Textile Corporation, Madhya Pradesh Handicrafts Board, Khadi and Village Industries Board, and Madhya Pradesh State Mining Corporation.

Handicrafts. Certain parts of Madhya Pradesh have long been famous for village crafts. Chanderi Saris with their delicate weave are high favourites. Maheswar too is famous for its hand-woven saris. Blankets are woven in Mandsaur and carpets at Gwalior.

Gwalior has specialised in pottery and its products are popular among Indian as well as foreign buyers. Bhopal makes handbags with intricate gold and silver thread embroidery. Jabalpur with plenty of soft stone near the famous Marble Rocks produce soap powder and cigarette boxes, toys and vases from this stone. Brass work is done in Balaghat and Chhindwara and lacquer work in Seoni.

Roads. Total length of roads as on 1-4-1981 was 633788 km out of which 483788 km were surfaced. In 1977-78 there were 225,279 motor vehicles.

Railways. Bhopal, Bilaspur, Katni, Khandwa and Ratlam are important junctions for the Central & Northern networks.

Aviation. There are airports at Bhopal, Indore, Gwalior, Khajuraho and Raipur with regular scheduled services to Bombay, Calcutta and Delhi.

Tourism: The very heart of India: The State of Madhya Pradesh in the very heart of India is fascinating in its diversity and rich tourist potential. Some of the important centres are:

Gwalior: Famous for its beautiful fort which dominates the city like a great monolith; emperor Babar described it as the pearl amongst the fortresses of Hind. Besides the Gwalior fort other main spots are Raja Man Singh's Palace, Telika Mandir, tombs of Tansen and Ghans Mohammed, Chhatris Jaivilas Palace and the Gunjari Mahal Museum.

Khajuraho. The temples of Khajuraho represent some of the most exquisite specimens for Hindu architecture and sculpture. They were built between 950 and 1100 AD by the Chandelas, a Rajput clan. Today only 25 temples of the original 85 survive. The uniqueness of the temples lies in the vivid depiction of life in its myriad forms.

Sanchi. The oldest surviving and best preserved monuments, apart from those of the Indus valley are found here. The history of Sanchi goes back as early as Emperor Ashoka's reign in the third century B. C. and continues upto the 11th century A.D. Sanchi is one of the revered centres of Buddhist art in the world.

Mandu. Once known as Shadiabad "the citadal of Joy" it was a pleasure resort of the rulers of Malwa for centuries. The city is still haunted by the beautiful love stories of Rupmati and Baz Bahadur. Mandu is famous for its massive and masculine architecture, Mahels, arches, colonnades and Romanesque cathedrals.

Pachmarhi. Pachmarhi, on a lovely hill-girdled plateau in the evergreen satpura range, is at a comfortable altitude of 1067 metres. Unlike the Himalayan hill stations which are inaccessible in the winter, Pachmarhi enjoys excellent weather all year round. However, its most enchanting features are its great natural beauty and its air of tranquillity and solitude.

Kanha, Shirpuri and Bandhargarh National Parks: Some of the finest game sanctuaries in the country. The tiger roams free at Kanha and Bandhargarh.

Ujjain. One of the oldest and holiest of Indian cities. Formerly a centre of learning, Ujjain is sanctified with the memories of Sandipuri, Kalidas, Ashoka and Vikramaditaya.

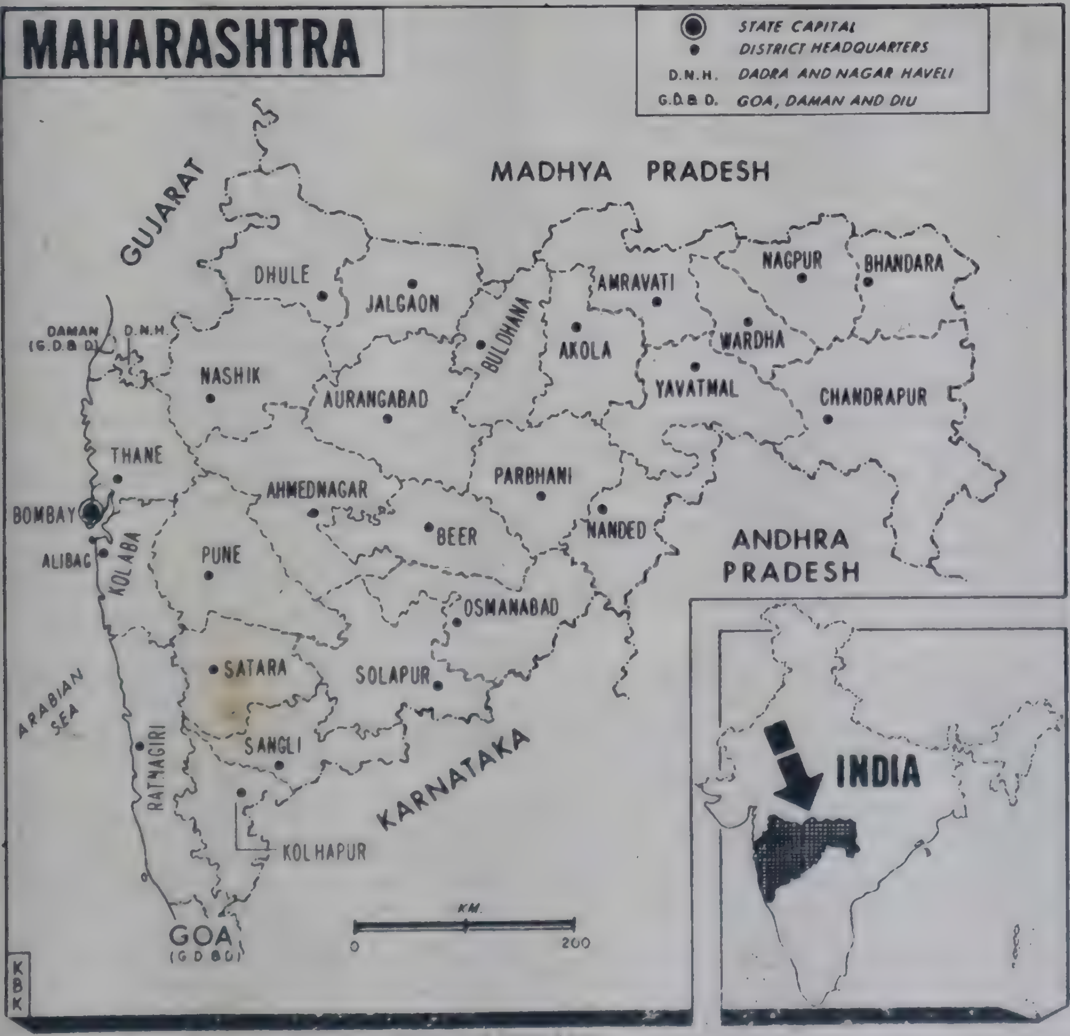
Amarkantak, a great pilgrim centre for Hindus, is picturesquely set at the source of the rivers Narmada and Sone.

Marble Rocks Jabalpur: Towering over the gorge through which the Narmada flows are the gleaming, jagged cliffs of limestone, over 100 ft. high in places.

168. MAHARASHTRA

Maharashtra is the third largest State in India both in area and population. Only Uttar Pradesh and Bihar have larger populations and Madhya Pradesh and Rajasthan have larger areas than Maharashtra. The State is bounded by the Arabian Sea in the west, Gujarat in the north west, MP in the north, AP in the south east and Karnataka and Goa in the south.

Physiography. The State of Maharashtra forms a huge irregular triangle with its base on the west coast of India, overlooking the Arabian Sea. The coastal strip, about 560 km. long and not more than 80 km wide, is the Konkan, dotted with paddy fields and coconut gardens. The Sahyadris or the Western Ghats running almost parallel to the sea coast flank the Konkan on its east. The Sahyadris with an average height of 1200 m. is covered with wet evergreen forests which merge into moist deciduous forests on its western side. Dry deciduous forests form a central belt, and thorn and scrub forests make up the eastern side. To the east of the Sahyadris stretches a vast plateau forming the apex of the triangle. This plateau is drained by the great rivers Godavari, Bhima and Krishna, which rise in the Sahyadris and flow eastward across the Indian peninsula, into the Bay of Bengal. The plateau is extremely fertile and provides excellent crops of cotton,



oilseeds and sugarcane. The rainfall in the State varies considerably. The areas west of the Sahyadris like the districts of Thane, Kolaba & Ratnagiri receive heavy rains with an annual average of 200 cm. The areas which lie in the rain-shadow of the Sahyadris, however, comprise the major portion of the State area and get an average rainfall of around 60 to 75 cm annually and in some areas less than 50 cm. These areas include the districts of Nashik, Pune, Ahmednagar, Dhule, Jalagaon, Satara, Sangli, Solapur and parts of Kolhapur.

History. Historically, Maharashtra falls into three regions, Western Maharashtra, Vidarbha and Marathwada. Among these, Vidarbha has a hoary past and is mentioned many times in the Mahabharata. Maharashtra as a whole figures in history during the Mauryan period when it became part of the Mauryan Empire. After the fall of the Mauryas, Maharashtra was under the domination of a number of Hindu dynasties for nearly a thousand years. The Yadavas, the last of these dynasties, ended in 1294. Thereafter the State came under a succession of Muslim rulers.

With the rise of Shivaji, Maharashtra entered a new phase in history. Shivaji welded the Marathas into a powerful nation. They became rulers instead of subjects. The Peshwas who succeeded Shivaji built up a Maratha Empire which extended from Gwalior in the north to Tanjore in the south. The Maratha power received a set-back at Panipat, in 1761, when the Afghan ruler Ahmed Shah Abdali routed the Maratha forces. They recovered only to confront the British power and to be decisively defeated in 1818. After the defeat of 1818, Maharashtra settled down as part of the Bombay Presidency under the British administration.

In independent India, Bombay continued as one State consisting of Maharashtra and Gujarat. This was an experiment in bilingualism –that is, one State comprising two linguistic units. The experiment did not work. Under the Bombay Re-organisation Act, 1960 Maharashtra and Gujarat were formed into separate States on May 1, 1960, Maharashtra retaining the old capital Bombay.

Administration. Legislature: The State has a bi-cameral legislature—the Legislative Assembly (Vidhan Sabha) and the Legislative Council (Vidhan Parishad).

The State is divided into the following districts.

Table 188
Population in Maharashtra
(1981 Census)

District	*Population 1981*	*Area in (sq. km)*	*Headquarters*
Greater Bombay	8243405	603	Bombay
Thane	3351562	9558	Thane
Raigad	1486452	7148	Alibag
Ratnagiri†	1379655	8249	Ratnagiri
Sindhudurg*	772555	5219	Kudal
Nashik	2991739	15530	Nashik
Dhule	2050294	13150	Dhule
Jalgaon	2618274	11765	Jalgaon
Ahmednagar	2708309	17048	Ahmednagar
Pune	4164470	15642	Pune
Satara	2038677	10484	Satara
Sangli	1831212	8572	Sangli
Solapur*	2591210	14874	Solapur
Kolhapur*	2465431	7633	Kolhapur
Aurangabad‡	1588031	9172	Aurangabad
Jalna*	1032157	8656	Jalna
Parbhani	1642610	11038	Parbhani
Beed*	1412430	10624	Beed
Nanded	1749334	10502	Nanded
Osmanabad¶	1029712	7510	Osmanabad
Latur*	1293442	7304	Latur
Buldana	1508777	9661	Buldana
Akola	1826952	10575	Akola
Amaravati	1861410	12212	Amaravati
Yavatmal	1737423	13584	Yavatmal
Wardha	926618	6310	Wardha
Nagpur	2588811	9931	Nagpur
Bhandara	1837577	9213	Bhandara
Chandrapur**	1418306	10490	Chandrapur
Gadhachiroli	637336	15433	Chandrapur§

† Provisional.

* Reorganised as Ratnagiri and Sindhudurg district with effect from 1st May 1981.

‡ Reorganised as Aurangabad and Jalna districts with effect from 1st May 1981.

¶ Reorganised as Osmanabad and Latur districts with effect from 16th August 1982.

** Reorganised as Chandrapur and Gadhachiroli districts with effect from 26th August 1982.

§ Gadhachiroli from 1st May 1983 onwards.

Agriculture. The major food crops are rice, wheat, jowar and bajra, while the main cash crops are sugarcane, cotton and groundnut. The area of foodcrops in proportion to non-foodcrops is approximately 2:8, the percentage under the foodcrops being 3.6 and that under non-foodcrops being 26.4.

Irrigation. The water resources of the State are extremely inadequate. Only around 11.6 per cent of the sown area receives irrigation.

Animal Husbandry. The total livestock in Maharashtra as per the 12th Livestock Census of 1978 was about 29 lakhs.

Table 189
Livestock and Poultry

(in thousand)

Item	
Cattle	15218
Buffaloes	3899
Sheep and goats ..	10199
Other Livestock ..	326
Total Livestock ..	29642
Poultry	18751

Forests. The total area under forests in the State in 1981-82 is estimated at 63,813 sq. km. At the end of 1980-81 it was 63,989 sq. km (nearly 21 per cent of the geographical area of the State.)

The major forest products are timber and firewood. Teak is the chief timber. Minor forest products include leaves (mainly Kendu leaves for beedies), Sandalwood, grasses and bamboos fibres, gums, and resins and animal products like lac, honey and wax.

Fisheries. With a coastline of 720 km the State has great potential for marine fisheries

In 1979-80 the State produced 358 thousand tonnes of marine fish and 24 tonnes of inland fish.

Table 190
Minerals production in Maharashtra (†)

(Quantity in thousand tonnes)
value in thousand Rs.

Mineral	*1980**	
	Quantity	*Value*
Chromite	3	640
Coal	5300	605360
Iron ore	1388	45758
Limestone	665	13170
Manganese ore	223	49788
China Clay (Natural)	6	123
Bauxite	349	8841
Salt	495	—
Dolomite	27	692
Gypusm	—	—
Silica Sand	80	2110
Ochre	3	39
Corundum	1	678
Kyanite	28	6239
Steatite	2	15

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† Excluding Minor Minerals.

* Provisional

Power. The installed capacity in the State stood at 4298 mw. on March 31st 1981. The number of villages electrified in the State in 1980-81 was 2168. Additional 429 villages were electrified between April and September 1981 bringing their total to 28,343 by the end of Sept., 1981.

Industry. There are several large-scale industries including textiles, ginning and pressing, silk, rayon, synthetic fabrics and vegetable products in Maharashtra. Most of the textile mills are located in Bombay. There are also several sugar factories in the State. Important chemical industries include nitrogenous fertilizers, superphosphates, petro-chemicals, drugs and pharmaceuticals and photographic chemicals.

Table 191
Industrial Production in Maharashtra (1979—80)

(Rs in crores)

Industry Group	*Productive capital*	*Value of output*	*Value added*
Manufacture of food products	403	1409	112
Beverages, tobacco and tobacco products	56	164	38
Cotton Textile	354	1206	370
Wool, Silk and Synthetic fibre textiles	119	552	108
Textile products	40	221	33
Wood products & furniture & fixtures	12	30	6
Paper & paper products, printing, publishing and allied industries	127	337	96
Leather & fur products (except repairs)	5	30	6
Rubber, Plastic, Petroleum & Coal products	219	956	111
Chemicals & chemical products	1223	2665	632

Non-Metallic mineral products	82	170	46
Basic metallic mineral products	290	880	154
Metal products and parts (except machinery and transport equipments)	172	507	137
Machinery, machine tools & parts (except electrical machinery)	369	862	230
Electrical machinery, apparatus, appliances and supplies and parts	243	687	166
Transport equipment and parts	501	791	192
Other manufacturing industries	55	136	29
Others	1834	780	222
Total	6015	12383	2688

Literacy & Education. The percentage of literacy for Maharashtra, according to 1981 Census, was 47.02, up from 39.18 in 1971.

Table 192
Educational Institutions 1979

Category	*Number of institutions*	*Enrolment*
Pre-primary	855	74389
Primary	49877	8270686
Secondary	6026	3092000
Training of teachers	155	16047
Professional Education (Under-graduate level)	213	57920
Teacher training (School level)	8	649
Higher education	724	557081
Special education (School level)	853	70151

Public Health. Medical facilities in the State as on 31st Dec., 1979.

Table 193

No. of Hospitals	968*
No. of beds	85,922
No. of Primary Health Centres	430
No. of Dispensaries	3139
No. of Primary Health Units	366
T. B. Hospitals and Clinics (No.)	90
Bed per lakh of population	144*

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* Include private hospitals and their beds.

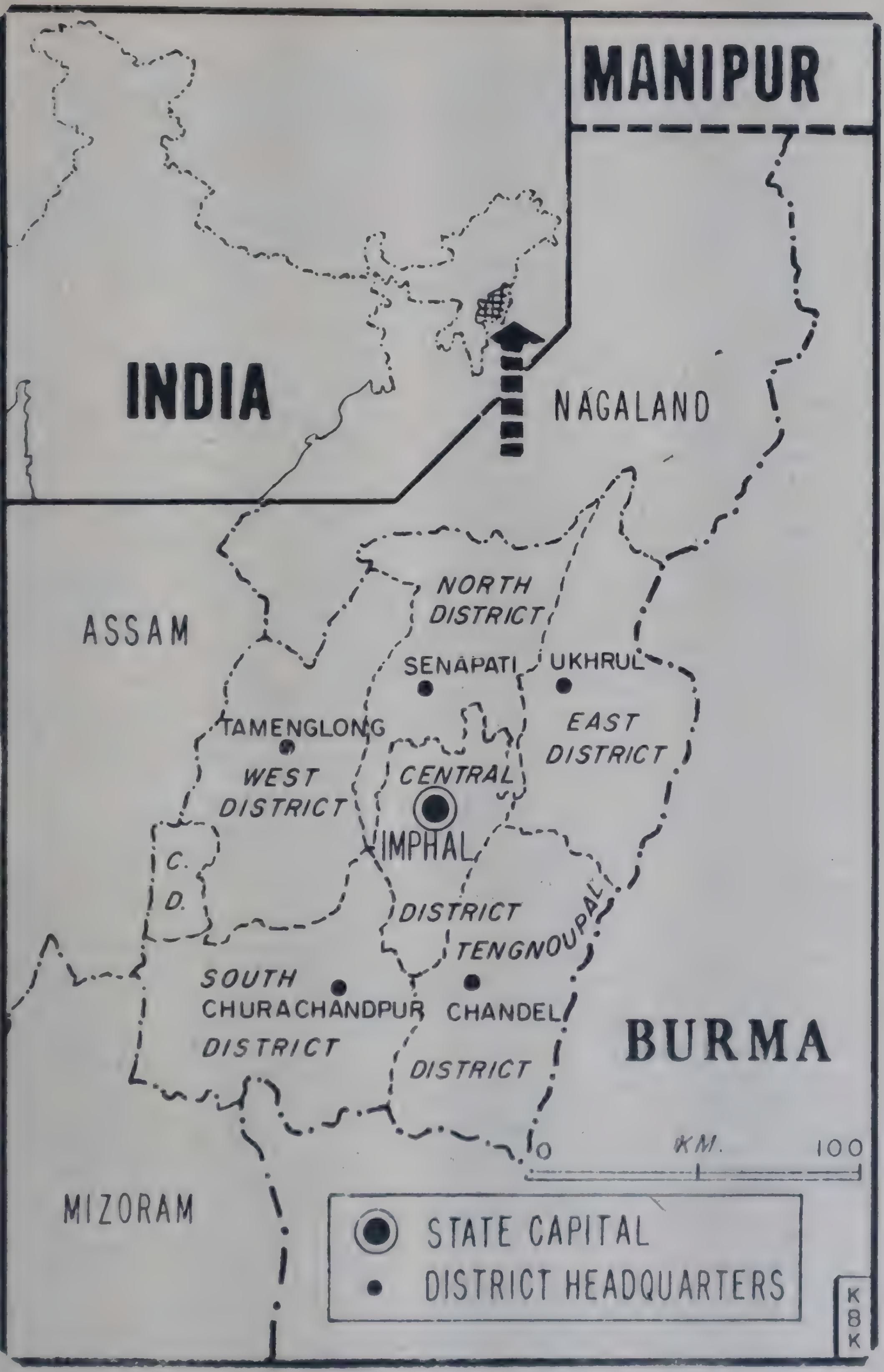
MANIPUR

Manipur lies on the north eastern boundary of India, south of Nagaland. Burma lies to its east and south, Mizoram to the south-west and Assam to the west. Manipur was a princely State, when it acceded to the Indian Union. It was made into a Union Territory under the States Reorganisation Act, 1956. It became a fullfledged State on Jan. 21, 1972.

Physiography. Manipur is a hilly state. About 90 per cent of its area is made up of hills. The rest is plain land. The major portion of the plain comprises what is known as the Manipur Valley. This is in the centre of the State, at an elevation of about 790 metres above the sea level and is about 1843 sq. km in area. It is oval in shape and is surrounded on all sides by hills. The capital city Imphal is situated in this valley. The rest of the plain land lies in the Jiribam sub-division along the Assam-Manipur border.

Lakes. The Manipur hill ranges, generally speaking, rise to the north reaching well over 3000 metres in height. The height diminishes gradually to the south. For this reason, all the rivers of Manipur flow from north to south. This is also the reason why the southern part of the valley is studded with lakes. The more important lakes are Loktak, Pumlen, Ikop and Waithou. Loktak is the biggest with an area of 104 sq. km in the rainy season and 64 sq. km during the dry season. There is a cluster of low hills in the lake forming a group of tiny islands. The highest hill is about 141 metres above the water level. There are fishing villages on the islands. All lakes are important as fisheries. Many varieties of fish are found in these lakes.

Rivers. The most important rivers of Manipur are the Imphal, the Iril, the Thoubal, the Irang and the Barak. All these rivers flow from the north to the south. The Imphal rises in the northern hills, flows through the capital and traverses the entire length of the Valley. After it leaves the plain it enters the hilly region, where it passes through a gorge and joins the Chindwin, a tributary of the Irrawady.



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The Iril and the Thoubal join the Imphal, the Iril some 10 km to the south of Imphal (city) and the Thoubal some 6 km further down. The Barak and the Irang flow through narrow valleys in the north and north-western hills. The Barak is called the Surma when it reaches the Sylhet district of Bangladesh.

Climate. The climate of the valley is temperate and delightful. The average annual rainfall in Manipur is about 202 cm. The bulk of the rainfall is from the south west monsoon. The climate in the north eastern hills is colder and somewhat wetter.

History. Manipur had an almost uninterrupted political history from the first half of the first century A. D. In A. D. 33 the Valley was divided into seven principalities. An Indian adventurer named Pakhanoba, occupied one of the principalities and established a dynasty. His successors expanded the principality till in the 8th century A. D. it covered the whole Valley and the ranges of the hills around. The dynasty continued in power with various changes of fortune till the integration of the State with the Indian Union in 1949.

People. Four categories of people have mingled to produce the present Manipuri-speaking population: (1) those who were in the valley before A. D. 33, (2) those who colonised the central part of modern Imphal (West) in A. D. 33, (3) the immigrants from other parts of India and (4) the immigrants from Upper Burma.

The Manipuries originally believed in a hierarchy of gods, the chief of whom was Soraren (Sora-God, ren-Chief). But by the 8th century A. D. they appear to have adopted Puranic Hinduism.

The principal language is Manipuri, which is spoken by some 63.24 per cent of the population. It is one of the oldest languages spoken in India today. In the hill areas many dialects are spoken. Each tribe has a dialect of its own. But no dialect claims more than 6 per cent of the population.

Administration.[*] Legislature: The State has a unicameral legislature—the Legislative Assembly. The State is divided into six districts.

Table 194
Districtwise Area, Population and Headquarters

(1981 Census Provisional figures)

District	*Area (sq. km)*	*Population*	*Headquarters*
Manipur North	3417	154179	Senapati
Manipur West	4344	62233	Tamenglong
Manipur East	4409	82969	Ukhrul
Manipur South	4581	133965	Churachandpur
Manipur Central	2230	922611	Imphal
Tengnoupal	3375	55348	Chandel

Economy. The State's economy is very unbalanced. Agriculture including livestock accounts for about 52 per cent of the State's Domestic Product at 1970-71 prices. In 1979-80 the contributions of various sectors were as follows:—

Agriculture including livestock 51.0 per cent; Trade, storage, hotels and restaurants 9.95 per cent; Manufacturing 5.8 per cent; Public services 7.2 percent and other industries 19.1 per cent.

The contribution of agriculture fluctuates widely from year to year depending upon rainfall and other climatic conditions. The state has no large scale industrial units. The per capita income is very low, Rs. 438 only as compared with the All-India average of Rs. 673 (provisional estimates) for 1979-80 at 1970-71 prices.

Economic Census. According to the provisional results of the 1980 Economic Census, the number of enterprises in the State is 34,127 out of which 31,864 are non-agricultural and 2263 agricultural enterprises. The number of persons usually working in non-agricultural enterprises is 96,894 and in agricultural enterprises is 4607 in the State. The number of enterprises ranges from 1017 in Manipur West District to 25,368 in Manipur Central District, so also the number of persons usually working in the enterprises from 4303 in Manipur West District to 71,134 in Manipur Central District. The non-agricultural enterprises accounted for 93.37 per cent of the total enterprises enumerated in the state. In the rural areas of the State, 94.75 per cent of the agricultural enterprises were carried on without employing any hired person. In the urban area 76.26 per cent of non-agricultural enterprises were run by own account workers. In the non-agricultural sector 23.73 per cent of the entreprises employed at least one hired worker on a regular basis. 23.96 per cent of the enterpreneurial activity was carried on without separate premises of their own in different parts of the State.

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[*] The Government led by Shri R. K Dorendra lasted for about 11 months. He resigned on the 26th Nov.1980 Shri Rishang Keishing, the former Deputy Chief Minister was sworn in on November 27, 1980. But the Ministry did not last long. The State came under President's Rule with effect from 28th February 1981 .Then a Cong. (I) Government led by Shri Rishang Keishing was sworn in on June 19, 1981.

Agriculture. Agricultue dominates the economy. Rice accounts for 80 per cent of the agricultural production. Cultivation is carried on in very small holdings. Nearly one-third of the population (31.91 per cent) cultivates holdings between 1.25 and 2.50 acres. Large holdings above 10 acres hardly number 200 in the valley.

Table 195

Number of Livestock and Poultry
(1977–78)

Livestock & Poultry		*Number*
Cattle	..	533269
Buffaloes	..	94316
Sheep	..	7229
Goats	..	33568
Horses, ponies & mules		1031
Pigs	..	176090
Others	..	32689
Total Livestock	..	878192
Fowls	..	2464774
Ducks	..	211690
Others	..	68780
Total Poultry	..	2745244
Total Livestock & Poultry		3623436

Forests. About 68 per cent of the land is under forests. This is well above the national average of 20 per cent and is more than the norms prescribed for hilly areas. The major forest products are timber (round wood) and fuel. Minor products include bamboos, grasses, incense and perfume, vegetation and cinnamon.

Fisheries. Fish is an important item in the diet of the majority of the population and fishing an important occupation for the rural folk. Fishing is carried on in the lakes and rivers. The indiscriminate fishing has resulted in a shortage of fish in the lakes and rivers.

Minerals. The state so far as is known, is poor in minerals. Limestone is the major mineral available. Soft stones appear to be substantial. Pockets of asbestoes, lignite, copper and nickel ores are found.

Industries. The State is industrially very backward. There are few industries worth the name though an industrialisation programme is currently being taken up. At present, a Khandasari sugar factory has started functioning. A spinning mill is coming up at Loitang Khunou while efforts are being made for establishment of paper mills, a cement factory, a cornflakes and starch factory.

The number of factories registered under Section 2m (i), 2m (ii) and the Indian Factories Act, 1948 in the State was 288 only in 1979. Out of this 38 units were sick and only 250 units were found working in the year.

According to the census of small scale industrial units conducted in 1980 the State had 1116 registered small scale industrial units.

Handloom industry is the most important industry in the State. It is mainly carried on as a household industry by the womenfolk. The products are varied and colourful and are in great demand both within & outside the country.

Power. The State has no coal or oil, but it is endowed with a rich hydropower potential and proper exploitation of this rich resource will go a long way in solving the present power shortage. In 1979-80 the State had an installed capacity of 14837 kw. Electricity generated during the year 1979-80 was 206.15 lakh kwh. The State has the lowest per capita consumption of electricity in India.

At present, the main hope for cheap power in the State is the 'Loktak Hydel Project.' The project is expected to be commissioned by the end of 1982. On completion, it would supply adequate power not only to this State but to other neighbouring States/Union Territories also.

Education. Manipur has a fairly high percentage of literacy, 32.9 per cent. The State has a good number of schools and and a university centre—the Manipur University centre.

Table 196

Educational Institutions 1977-78

Type of Institutions	*No. of Scholars*	*No. of Teachers*
	In 1979-80	
College for general education	17488	716
College for Prof/Other Education, Course	2638	338

High/Higher Secondary Schools	70740	3228
Middle Schools	42466	2232
Primary Schools	169470	10524
Nursery Schools	54	4
Schools for Professional & Other Education	13041	553

Public Health. In 1980-81 the State had 45 Hospitals including Primary Health centres and 190 Dispensaries including Primary Health Sub-Centres.

Table 197
Medical Facilities

Number of beds available*	945
Population per bed	1494
Number of Doctors*	219
Population per Doctor	6445
T. B. Hospital	2
Leprosy Hospital	6
V. D. Clinic	2

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* Excluding R. M. C. Hospital, Manipur.

170. MEGHALAYA

Meghalaya, literally 'the abode of the clouds' (Megha-clouds, Alaya-abode), was inaugurated as an autonomous unit on April 2, 1970. It was declared a State of the Indian Union on January 21, 1972.

Physiography. The exclusive tribal State of the Khasis, the Jaintias and the Garos is a mountain region. Shillong, the capital of Meghalaya, is situated in the centre of a high plateau. The highest peak in the State is the Shillong Peak 6450 ft. in height. Nokrek in the Garo Hills district is the next highest peak.

A number of rivers, none of them navigable, drain this mountainous area. Krishnai (Damring), Kalu (Jira), Bhugai (Bugi), Nitai (Dareng) and Someswari (Simsang)* flow through the Garo Hills

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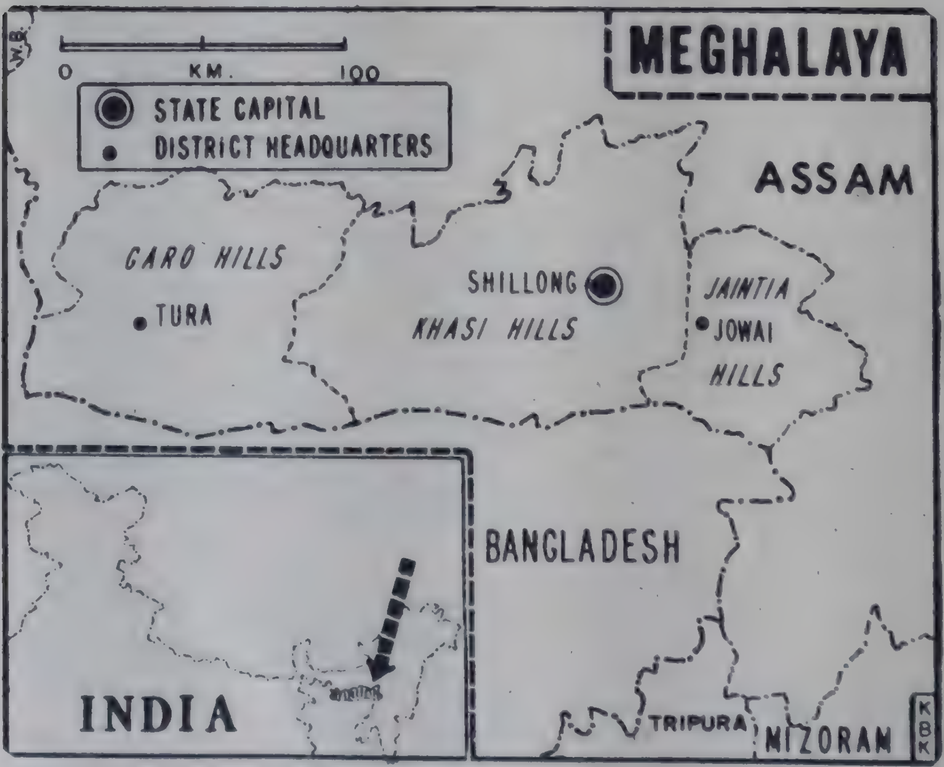
* The names in brackets are tribal names.



Based upon Survey of India map with the permission of the Surveyor General of India
© Government of India Copyright 1979
The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified.
The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

District, Kynshi, Khri, Umtrew, Umngot, Umiam Mawphlang and Umiam Khwan flow through Khasi Hills district, while Kupli, Myntdu & Myntang flow through Jaintia Hills district. All these rivers with rocky beds and swift currents abound in cataracts and waterfalls. The most picturesque waterfall is the one at Mawsmai called Nohsngi-thiang near Cherrapunjee. Here, the waters of several rivulets are precipitated over a sheer cliff several hundred feet high.

The average annual rainfall of the State is 1000 to 1270 centimetres. In the capital city of Shillong, rainfall averages 241.5 centimetres per annum. The Cherrapunjee-Mawsynram belt in the southern slopes of Khasi Hills has the distinction of having the world's heaviest rainfall, with an average of 500 inches (1270 centimetres) per annum.

Meghalaya, known as the Scotland of the East, is a country of surpassing scenic beauty. Waterfalls and mountains, lakes, rising peaks and billowing hills, meadows, valleys and rushing rivers combine to make a rich panorama.

The people The Khasis, Jaintias and Garos are very ancient tribes, who had settled in these hills in remote times. They numbered about ten lakhs.

Dance, music and sports reflect their way of life. Festive sounds of merry-making echo from hill to hill revealing the pulsating life of the tribal people. Mindful of their cultural heritage, these simple folk are jovial and hospitable.

The Khasis and Jaintias are held to be a remnant of the first Mongolian overflow into India. They established themselves in their present homeland in the remote past and owing, primarily, to their geographical isolation, they succeeded in maintaining their independence under their chiefs called Syiems and Dolois. The Khasi language is believed to be one of the few surviving dialects of the Mon-Khmer family of languages in India today.

Garo Hills is the homeland of nearly four lakhs of Garos. Legend has it that the Garos originally inhabited a province of Tibet named Torua. Leaving Tibet in the distant past under their chiefs, Jappa-Jalimpa and Sukpa-Bongepa, the Garos wandered in the Brahmaputra valley for centuries in search of a permanent home and survived the ordeals of wars and persecution at the hands of the kings ruling the valley. The Garos branched out into a number of sub-tribes and the main body under the legendary leader, Abong-Nonga, occupied Nokrek, the highest peak in Garo Hills. The Garos are part of the great Podo race, a branch of the Tibeto-Burman family.

The most distinctive feature of these hill people, their practice of matriarchy, distinguishes their social organisation from the rest of India. According to this, all relationships are traced through the mother. Under their customary law of inheritance, generally, property is handed down from the mother to daughters and the youngest one always receives the major share. The husband of the youngest daughter is expected to live with the parents-in-law and look after them in their old age. Among the Garos, the husband is generally sought from the mother's line, usually the maternal uncle's son. The parents, boys under six and the girls live under the same roof. The older boys live in a house called Nopante which serves as a bachelors' quarters, but they work on the land for the family. The essence of the whole system is that landed property passes down undivided through a daughter. Like tribal people elsewhere in the country, the whole family is engaged in Jhumming or shifting cultivation.

The hill people take plenty of meat. They rear fowls, pigs and cattle, the last more for meat than milk.

The male members of the society are fond of rice beer but fermented liquor is also now being commonly consumed. They thoroughly enjoy themselves by drinking and dancing on the occasions of fairs and festivals like Wangala, the harvest festival of the Garos, Shadsukmynsiem and Pomblang Nongkrem, the thanksgiving dance and festivals of the Khasis and Behdeinkhlam the annual festival of the Jaintias.

They believe in God, and in good and bad spirits. Their tolerance is best displayed by the fact that while the parents are content to live in their old conservative ways, they do not mind their children becoming converts to Christianity and other faiths.

Administration. Meghalaya is a constituent State of the North Eastern Council. The State has a unicameral legislature. The Legislative Assembly consists of 60 members—29 from Khasi Hills, 7 from Jaintia Hills and 24 from Garo Hills.

The following table shows the district-wise area and population of the State according to the provisional figures of 1981 census.

Table 198

District	*Head-quarters*	*Area (sq.km)*	*Population*
East Khasi Hills	Shillong	5196	506687
West Khasi Hills	Nongstoin	5247	160660
East Garo Hills	Williamnagar	2603	135864
West Garo Hills	Tura	5564	369139
Jaintia Hills	Jowai	3819	155993

Meghalaya, originally, comprised two districts and three subdivisions. In order to accelerate the pace of development and to bring the administration closer to the people, the State has now been re-organised into five districts, seven sub-divisions and three administrative units. For an all-round development of the rural areas, the whole State is now covered by 30 Community Development Blocks.

There are 4874 inhabited villages and 12 towns: (1) Shillong, the capital of Meghalaya, is also the headquarters of East Khasi Hills (2) Jowai the headquarters of Jaintia Hills (3) Nongstoin, the headquarters of West Khasi Hills (4) Williamnagar, the headquarters of East Garo Hills, (5) Tura the headquarters of West Garo Hills (6) Shillong Cantonment (7) Mawlai (8) Nongthymmai, (9) Madanrting (10) Pynthorumkhrah, (the last 5 are in fact the suburbs of the State capital) (11) Cherra-Punjee, the sub-divisional headquarters of Sohra, in East Khasi Hills and (12) Baghmara the sub-divisional headquarters of Baghmara in West Garo Hills.

The population of the State is primarily tribal as the following figures show:

Table 199

Scheduled Castes and Tribes Population 1971

	Scheduled Castes	*Scheduled Tribes*
East & West Khasi Hills	1878 (0.38)	380069 (77.37)
Jaintia Hills	8 (0.00)	108289 (95.09)
East & West Garo Hills	2001 (0.39)	325872 (80.14)
Total Meghalaya	3887 (0.38)	814230 (80.48)

Agriculture. The majority of the people depend on land for their livelihood. But the potential for agricultural expansion is very limited in Meghalaya as only 1,909,994 hectares of the land are cultivable. Jhumming or shifting cultivation, practised in this State on a large-scale, is one of the biggest problems to be tackled in Meghalaya. This traditional practice is deeply rooted among the hill people. However, the State Government has made a modest beginning with a scheme to help the farmers to settle on lands which are suitable for steady cultivation. The State's Soil Conservation department's re-settlement scheme called Jhum Control Scheme envisages allotment of improved land to villagers together with supply of fertilizers, seeds, irrigation facilities etc. The developed lands would also be linked with roads for marketing the produce. At present, villages in selected areas with a minimum of 50 families are growing crops by modern methods.

Forest. Meghalaya is rich in forests. The total forest area is 822,912 hectares. Production of timber amounted to 6606.1 cubic metres and firewood 730.5 cubic metres in 1974-75. The principal timber species are sal, gurgra, haldu, dalu and pine. Birch, schuma oak, beech and magnolia are also found.

Power. Meghalaya has several swift-flowing rivers from which cheap hydro-electric power can be generated. There are at present four hydel and one thermal projects with a total installed capacity of 132.2 MW. Another hydel project is under construction.

Minerals. Meghalaya's mineral wealth is yet to be assessed. The estimated reserves of coal are about 1200 million tonnes. Limestone reserves are of the order of about 2100 million tonnes and clay deposits ten million tonnes.

Industries. The State is not so far industrially developed. However, new industrial

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Meghalaya in the 1981 census

Provisional figures

Population total	..	*1,328,343*
Males	..	*679,519*
Females	..	*648,824*
Decadal population growth rate	..	*316,644* *(31.30)*
Density of population (persons per sq. km)		*59*
Sex ratio(Females per 1000 Males		*955*
Literacy rate total	..	*33.35*
Males	..	*36.97*
Females	..	*29.55*

units set up by or with the help of the Meghalaya Industrial Development Corporation are fast coming up. Some of them are:

The Meghalaya Plywoods Ltd., The Associated Beverages (P) Ltd., The Meghalaya Essential Oils and Chemicals Ltd., The Meghalaya Phyto-Chemicals Ltd.

The public sector cement factory at Cherrapunjee known as the Mawmluh-Cherra Cements Ltd., which is producing 250 tonnes of cement daily, is in the process of expansion to a production capacity of 930 tonnes per day.

Education: In Meghalaya the average rate of literacy is 33.35 per cent. The State has a good number of educational institutions also.

Table 200
Educational Institutions & Enrolment

	1977-78	*('000)*
Pre-Primary and Pre-basic	379	17.71
Primary and Junior Basic	3445	180.78
Middle, Senior Basic	384	31.36
High, Secondary	155	37.76
Teacher Training	10	0.37
Training College	1	0.31
Vocational Schools	125	4.05
Colleges	12	10.22
University	1	0.53

Table 201
Public Health 1977-78

Hospitals etc. (Govt.)	*Nos.*
Hospitals	7
Dispensaries	57
Sub-centres	30
Primary Health Centres	19
Beds	1006
Allopathic Doctors	140
Nurses and Midwives	278

Wild-Life. Meghalaya was once rich in wild life. Some of the rare species that can be found in the State are the golden cat (felis temmineki), clouded leopard (neofelis-nebulosa), Hoolock (hylobates hoolock) and Slow Loris (nycticebus concang).

Tourism. Meghalaya is a 'dream-come-true' for the tourist. The charms of this land are many-splendoured and unique. Here is a happy land of magnificent beauty undulating hills, rolling grassland, cascading waterfalls, snaking rivers, terraced slopes and thrilling wild life. Some of the important tourist spots are: (1) Umiam Lake by the side of the Shillong-Gauhati road provides a most fascinating view. Fishing is a great sport over here. (2) Kyllang Rock, about 55 kilometres west of Shillong, is an interesting tourist spot. Rising out of the rolling grassy downs, it is an imposing dome of granite more than 700 feet in height. (3) Nohsngithiang falls at Mawsmai near Cherrapunjee, overlooking the hazy blue plains of Bangladesh, has an appeal unparalleled in the whole of India. And the Mawsmai caves are full or wonders to the eyes. (4) Nartiang, about 90 kilometres from Shillong, has a number of monoliths, the tallest being 27 feet high and ½ foot thick erected by the villagers of Nartiang between 1500 and 1835 A. D.

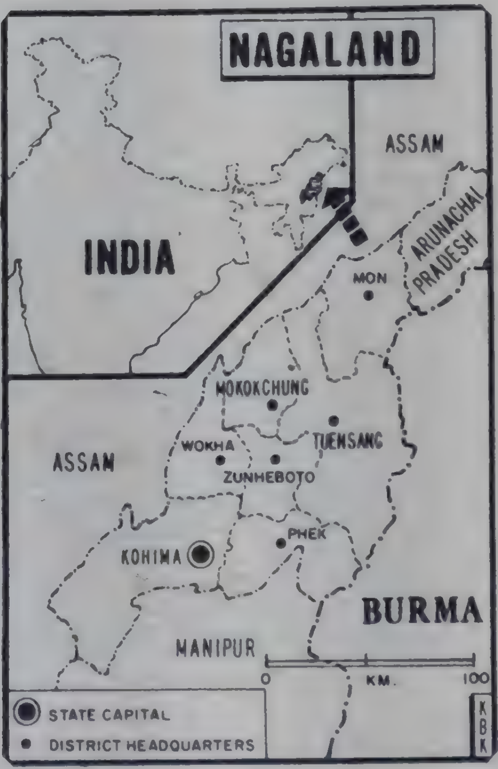
171. NAGALAND

Physiography. The State of Nagaland is a narrow strip of mountainous territory between the Brahmaputra valley of Assam and Burma. On the east it shares India's international boundary with Burma. On all other sides it is bounded by Indian territory —Manipur on the south, Assam on the west and north, and Arunachal Pradesh on the north east.

Excepting some areas in the foothills, the State is mountainous. Saramati, the highest peak, is 12600 ft. high and Kohima, the capital, is 4800 ft. above sea level. The main rivers that flow through the State are Dhansiri, Doyang, Dikhu and Jhanji. The State is inhabited by hill tribes, the chief of whom are Angami, Sema, Lotha, Ao, Rengma, Chakhesang, Sangtam, Konyak, Chang, Phom, Yimchunger, Khemnungan Zeliang and Kuki.

The People. The population of Nagaland is almost entirely tribal. There are many separate tribes and sub-tribes among the Nagas with their own distinctive languages and cultural features. Kohima district is the home of the Angamis, Zeliangs, Rengmas and a small group of Kukis, Semas and other minor groups. Mokokchung is the home of Aos, Wokha district of the Lothas and Zunheboto district of the Semas, Tuensang district is the home of the Chang, the Sangtam, the Khemnungan, the Yimchunger, the Phom, the Semas and other minor groups. Mon district is the home of the Konyaks. It is these people who chiefly practise Jhum cultivation.

Formation of the State. The Nagaland State comprises the former Naga Hills district of Assam and the former Tuensang Frontier division of the North East Frontier Agency. These had been made a Centrally Administered Area in 1957, administered by the President through the Governor of Assam. In January 1961 the Government of India conferred the status of a State on Nagaland. The State of Nagaland was officially inaugurated on 1st Dec., 1963.



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The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified

Administration. The State has a unicameral legislature—the Legislative Assembly.

Table 202

Districtwise Area and Population

District	*Area (Sq.km)*	*Population 1981*	*Head-quarters*
Kohima	4041	250105	Kohima
Phek	2026	70618	Phek
Mokokchung	1615	104193	Mokokchung
Zunheboto	1255	61161	Zunheboto
Wokha	1628	57583	Wokha
Tuensang	4228	152332	Tuensang
Mon	1786	73938	Mon
Nagaland	16579	774930	

Originally the State was divided into 3 districts. In Dec. 1973, the districts were reconstituted as above: 1. Kohima, 2. Phek, 3. Mokokchung, 4. Zunheboto, 5. Wokha, 6. Tuensang and 7. Mon.

Agriculture. Although agriculture is the mainstay of the State, only a little more than one-third of the total area is cultivable. Considering the hilly terrain, this is not unusual but the main drawback is that cultivation is vitiated by what is called jhumming. Under this system, forest lands are cut down and burned and crops are planted in the burnt out lands. After a crop or two, these lands are abandoned and fresh forests are cut down and burnt. This leads to soil erosion and permanent loss of fertility to the soil.

But now the Govt. is encouraging terraced cultivation under various developmental programmes which are increasingly being adopted by the people.

Animal Husbandry. In Nagaland, every family owns a few pigs, some poultry and cattle, as meat forms the main item of food. Along with the gradual urbanisation, milk and eggs are becoming more popular. Though Nagas are fond of keeping domestic animals and birds, the livestock and poultry are of a nondecript type, with poor productivity. The State is encouraging the development of better cattle and poultry. There are 4 cattle breeding farms, 6 pig breeding centres and 1 rearing centre each for sheep and goats. There are 7 centres for poultry, including hatcheries and chick rearing centres.

Inland fisheries are also being developed scientifically.

In sericulture, Nagaland is making excellent progress. There are now 18 sericulture farms in Nagaland.

Forests. The State of Nagaland is estimated to have an area of 2882 sq.km under forests, which is only 17.38 per cent of the total area.

Out of this forest area, only 16.17 per cent (466sq. km) is under reserved forests and distributed in Kohima and Mon districts and about 17.97 per cent (618 sq.km) under protected forests. The remaining 65.86 per cent (1898 sq. km) of forests consists of village forests.

Power is short in Nagaland. At present, the installed capacity is 5.12 MW. Electrification, however, is progressing. Per capita consumption of electricity was 47.51 units (1981-82). Out of 966 villages in Nagaland, the villages and towns electrified numbered 320 in 1980.

Industry. Nagas have an artistic hand in many crafts. Carving of beautiful designs with their simple equipment like dao, home-made colours and pieces of bamboo is practised mostly for domestic and local requirements.

Nagaland has achieved remarkable progress in small and medium industries. Big industries are being planned although at present there is only 1 sugar mill, 1 pulp and paper mill and 1 plywood factory. One cement factory is also coming up.

Among the new industries are plastic moulding, hume pipes, polythene bags and rubber chappals.

Table 203
Education
1980-81

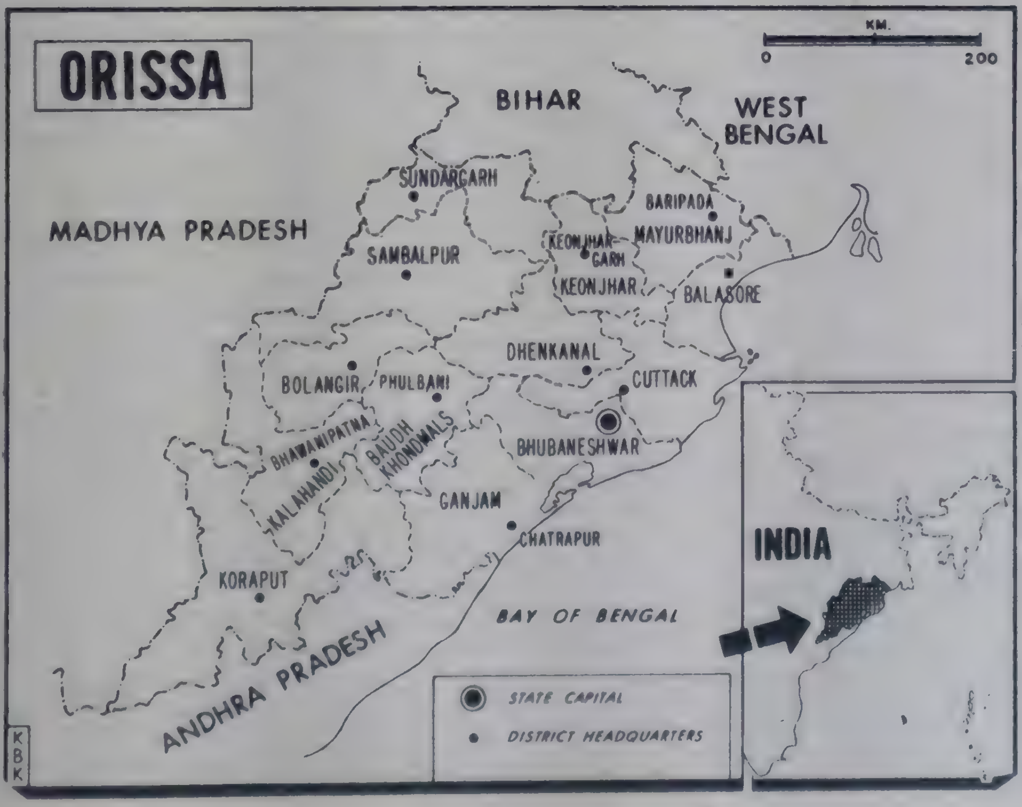
Primary Schools	1144	(Govt. & Pvt.)
Middle Schools	303	-do-
High Schools	111	-do-
Colleges	11	-do-
Adult Literacy	560	Govt.
J.T.T.I.	3	-do-
I.T.I.	1	-do-
Polytechnic	1	-do-
Training College	1	-do-

Table 204
Public Health
1980-81

Hospitals	....	30
Dispensaries	....	79
Primary Health Centres	....	17
Sub-centres	....	76
Beds	....	1307

172. ORISSA

Physiography. Orissa lies on the east coast of India. It is surrounded by West Bengal in the North-East, Bihar in the North, Andhra Pradesh on the South-East. Madhya Pradesh on the West and Bay of Bengal on the East. The whole State lies in the tropical zone and is divided into four distinct tracts, viz. the northern plateau,



The boundary of Meghalaya shown on this map is as interpreted from the North Eastern Areas (Reorganisation) Act 1971 but has yet to be verified

The territorial waters of India extend into the sea to a dist from the appropriate base the eastern ghats, the central tract and the coastal plains. The State is drained by three great rivers, the Mahanadi, the Brahmani and the Baitarani and some lesser rivers, all of which flow into the Bay of Bengal.

The biggest and the most famous lake in Orissa is Chilka lake. Originally, it was part of the Bay of Bengal, but was subsequently closed up by sand dunes. It is 64 km long and 16 to 20 km wide. There are two beautiful islands in the lake namely Parikud and Malud. Two other lakes call for mention, the Ansupa lake (Cuttack District), about 5 km long and 1.6 km broad, and the Sara Lake, (Puri District) about 5 km long and 3 km wide

Orissa has an equable climate, neither too hot nor too cold. In some places, however, extremes of climate are experienced, namely, in the western districts like Bolangir, Sambalpur and Sundargarh. The average rainfall in the State is 150 cm. There is no desert or semi-desert area in the State.

History. Orissa, the land of the Oriyas, was known as Kalinga in the ancient days. In the third century B.C. (268 B.C.) Ashoka the Mauryan emperor, sent a powerful force to conquer Kalinga which offered stubborn resistance. Kalinga was subdued but the carnage which followed, struck Ashoka with remorse. It is here, where Ashoka "the Terrible" was transformed to Ashoka "the Compassionate". After the death of Ashoka, Kalinga regained its independence. In the second century B. C. Kalinga became a powerful country under its ruler Kharavela. With the death of Kharavela, Orissa passed into obscurity. In the 4th century A.D. Samudragupta set out on his conquest of the south from Magadha. He invaded Orissa, which lay astride his path and overcame the resistance offered by five of its kings. In A.D. 610 Orissa came under the sway of King Sasanka. After Sasanka's death Harsha conquered Orissa.

The country had its own independent dynasty of rulers (the Ganga dynasty) in the 7th Century A.D. In A.D. 795 Mahasivagupta Yayati the Second, came to the throne and with him began the most brilliant epoch in the history of Orissa. He united Kalinga, Kengoda, Utkala and Kosala in the imperial tradition of Kharavela. He is believed to have built the famous Jagannatha Temple at Puri. Under the kings of the Ganga dynasty, Orissa continued to flourish. Narasingha Dev of this dynasty is reputed to have built the unique temple of the Sun at Konarak.

From the 14th century, Orissa was ruled by successive Muslim Kings till 1592 when Akbar annexed it to the Mughal Empire. With the decline of the Mughals, the Marathas occupied Orissa. They continued to hold it till the British took over in 1803.

Orissa was made into a separate province in 1936. With independence, the Princely States in and around Orissa, surrendered their sovereignity to the Government of India. By the States Merger (Governor's Provinces) Order 1949, the Orissa Princely States were completely merged with the State of Orissa on 19th August, 1949.

Administration. The legislature is unicameral–the Legislative Assembly consisting of 147 members.

The State is divided into 3 revenue divisions, Central, Northern and Southern Divisions and thirteen districts.

Table 205

Area, Population and Headquarters of Districts

Districts	*Area sq. km*	*Population (1981)*	*Head-quarters*
Balasore	6394	2253090	Balasore
Phulbani	11070	712772	Phulbani
Bolangir	8903	1452675	Bolangir
Cuttack	11211	4617748	Cuttack
Dhenkanal	10826	1576565	Dhenkanal
Ganjam	12527	2752699	Chhatrapur
Kalahandi	11835	1329780	Bhawani-patna
Keonjhar	8240	1109746	Keonjhar
Koraput	27020	2467329	Koraput
Mayurbhanj	10412	1576987	Baripada
Puri	10159	2911720	Puri
Sambalpur	17570	2274125	Sambalpur
Sundargarh	9675	1336818	Sundargarh

Orissa has a high percentage of Scheduled Castes and Tribes which together make 9.78 million out of a total of 26.37 million people.

Economic Structure. Orissa's agro-based economy is always upset by some natural calamities like flood, drought tornado or cyclone. Flood and drought are common to many States but only a few States are subject to cyclones and tornado. Orissa is one of the few. Cyclone has in recent years become a regular feature like flood or drought. In 1972 the State was hit by a cyclone that reduced the coastal districts to a shambles. In 1973 floods brought great damage in Balasore and Mayurbhanj districts. In 1974-75 a drought of long duration descended on the

State. According to official reports about 12 million people (or more than half of the population) in 1824 villages were affected by drought. In 1979 due to late monsoon and erratic rainfall an unprecedented drought situation developed throughout the State. About 26253 villages sustained crop loss of 50 per cent and more. In 1980 an unprecedented flood caused untold miseriss to the people in nine districts of the state.

Natural Disasters. On the 17th April, 1981, a Tornado struck 12 villages of Keonjhar District followed by a similar Tornado on 18th April, 1981 in 9 villages of Mayurbhanj District causing extensive damage both to private and public properties and exacting a toll of 40 human lives. Damage to public properties was to the extent of Rs. 9.83 lakhs. The total financial commitment for relief and rehabilitation was Rs. 41.81 lakhs.

The State witnessed two successive floods during 1981. The first took place in the last week of June in the rivers of Baitarani, Kochils, Gonguili and Budhabalenga affecting only the hearts of Balasore District. Crops over an area of 26,655 hectares were affected. Relief as admissible was given.

The second phase flood came in the month of August, 1981 especially in the rivers Vamsadhara, Rushikulya, Indravati affecting the District of Puri, Balasore, Ganjam, Koraput etc. 47 Blocks covering 1017 villages and 6 N. A. Cs. over an area of 87,669 hectares had been affected. Emergency relief was administered soon after the floods receded. A total sum of Rs. 237 lakhs was released in favour of construction work of different departments.

A cyclone storm hit the State during the period from 8th to 10th December, 1981 causing damage to crops, houses, educational institutions and other properties in three districts, namely, Cuttack, Puri and Balasore. The total financial commitment on account of the cyclone was Rs. 148 lakhs.

Rainfall during the year 1981 was erratic. As a result of this insufficient precipitation, agricultural operations were abnormally delayed in most parts of the State causing damage to crops.

Hailstorm and cyclonic wind occurred in almost all parts of the State from the last week of February, 1982 continuing till April, 1982 causing extensive damage in varying degrees not only to the standing Rabi crops and also to the private and public properties, besides causing death to 20 human beings and 1278 livestock. It affected as many as 91 Blocks, 3 N. A. Cs. and 1863 villages with a population of 4.62 lakhs, the cropped area affected being 41,605 hectares.

The devastation caused by the cyclone of 3rd and 4th June, 1982 to public and private properties was far in excess of that of the cyclone in the year 1971. The area and population affected were much larger. 110 Blocks and 28 Urban Local Bodies with 7 Districts of the state namely, Cuttack, Puri, Balasore, Dhenkanal, Keonjhar, Mayurbhanj and Sambalpur suffered damage of varying degrees.

Due to unprecedented rainfall in the downstream catchment of river Mahanadi below Hirakud Dam on 29th August, 1982 and 30th August, 1982 a peak flood of 15.80 lakh cusecs passed through the river Mahanadi causing extensive damage in Sambalpur, Bolangir, Kalahandi, Phulbani, Dhenkanal, Cuttack and Puri Districts.

The magnitude of the resultant flood was more serious in nature than any in recorded memory.

Severe damage was caused to the life and property on account of these floods in about 100 Blocks in 8 Districts with a population of more than 10 million and an approximate area of 90,000 sq. kilometres. Road communication was disrupted including very important roads like Bhubaneswar-Cuttack National Highway link, Bhubaneswar-Puri link and Cuttack-Sambalpur link. A number of breaches occurred in river embankments, Extensive damage was caused to roads and buildings.

Agriculture. The agricultural sector in Orissa contributes 68.5 per cent (at current prices) to the State income and employs 79 per cent of the working population. The cultivated areas comprise 61.30 (1980-81) lakh hectares which is about 39.3 per cent of the land surface of Orissa. The gross cropped area is about 87.46 (1980-81) lakh hectares, gross irrigated area is 17.11 lakh hectares. Rice is the most important crop. The State contributes about one-tenth of the rice produced in India. Other important crops are pulses, oil-seeds, jute and mesta, sugarcane, coconut and turmeric.

Forests. Forests cover some 60,223.96 sq. km. which is about 38.64 per cent of the total State area. The forests are not dense everywhere. In most places, they are mere shrubberies. Excellent timber like sal, teak and rosewood are found in the forests. Kendu leaf used in making beedies is the most important profitable forest produce of Orissa. Lac, Tussar silk and medicinal plants like Nuxvomica and Ruowolfia Serpentina are other forest products.

Irrigation. The surface water potential, estimated on the basis of the Khosala formula for Orissa rivers, is of the order of 106.52 million sq. ft. This is more than adequate for a total net cropped area of about 6 million acres in the State. But in the actual field, only a negligible percentage of the irrigation potential has been fruitfully utilised.

Table 206

Animal Husbandry

The State has a fairly large livestock population:

Livestock

(1977 Census:)

Cattle	12.12 million
Buffaloes	1.35 million
Sheep	1.43 million
Goats	3.41 million
Pigs	0.29 million
Mules	2522
Donkeys	225
Total Number of Cattle:	134.79 lakhs
Other Animals:	567,290

Poultry

Fowls	9.49 million
Ducks	
Total Poultry	8,819,016

Fisheries

Production of Fisheries in Orissa
(Figures in M. T.)

Departmental Production:	*1980-81*
(i) Inland (Fresh Water)	36,000 Tonnes
(ii) Marine	40,000 Tonnes
Total Production of other Organisations	44,000 Tonnes
Grand Total	120,000 Tonnes

Electricity. As power is the prime mover of the pace of economic development, the use of electricity is one of the best indications to judge the industrial growth and standard of living of a country.

The rate of progress of power generation in Orissa has been fairly high during the plan periods. Before the beginning of the First Plan the total installed capacity was only 9.6 MW. By the end of 1971-72 it increased to 564 Megawatts and has further increased to 914 Megawatts including small Thermal Stations.

This increase was mainly due to commissioning of Hirakud and Balimala Hydro-electric project and Talcher Thermal Plant.

Mineral Production. Orissa is a storehouse of mineral wealth. Huge deposits of coal, iron and manganese, some of the country's biggest deposits of chromite and lime-stone and many other valuable minerals such as dolomite, bauxite, graphite and quartizine etc. are found in abundance in the State. The known reserves of important minerals are of the following order.

Table 207

Mineral Deposits in Orissa upto 1982

(In Million Tonnes)

Minerals	*Quantity of Deposits*
Iron Ore (58% Fe)	Over 3300
Manganese (+28 Mn)	43
Vanadi Unbearing Magnetite (1% $V_2 O_5$ proved)	2
Chromite+(30% $Cr_2 O_3$)	113
Nickel Ore (+0.5% Ni)	120
Lead Ore (5% Lead)	5.6
Bauxite (40% A1203	1448
Coal (Non-coking) All grades over	30000
China clay do	35
Fire clay do	62
Quartz & Quartite (97% Sio_2)	15
Copper Ore 1.5% Cu	1.6
Limestone—All grades	700
Dolomite—17.22%Mg.	360
Mineral bearing sands (sillimanite, Limanite)	50

Industry. The total number of large and medium industries established including those that went into production by end of 1980-81 was 42 with an employment potential of 9870. Another 54 large and medium industries have gone into production with an employment potential of about 15,500. 92 heavy and medium industries are under implementation during the current financial year. 2600 small scale industries were set up during 1981-82 as against a target of 2500 units and provided employment to about 17,951 persons. The target for the year 1982-83 is to set up 2800 small scale industries.

Education. Orissa has a literacy percentage of 34.12 which is below the national average.

In educational development, Orissa was one of the most backward States of the country till the dawn of independence. In the year 1947-48, there were 6814 primary schools with an enrolment of 2,154,800 children and the number of teachers was 16,520. There were 286 Middle Schools, 106 High Schools and 12 Arts and Science Colleges and one University. The enrolment at the Middle and High School stages was 31,548 and 14,650 respectively. The total number of students in the colleges was 3885 of which 219 were girls.

With this background the First Plan on education was started. At the beginning of the 4th Plan the number of primary schools had risen to 26,381, Middle Schools to 3881 and High Schools to 1437. During the fourth plan period the number of primary schools, middle schools and high schools had risen to 31822, 4642 and 1858 respectively and colleges to 85.

Table 208

Number of Recognised Educational Institutions in Orissa (1981-82)

Type of Institution	*Number*
1. Universities	4
2. Arts, Science & Commerce Colleges 1981-82.	200
3. Under-Graduate College for Physical Education	1
4. Teacher's Training Colleges:	
(i) Degree and Post-Graduate Colleges	11
(ii) Under-Graduate Colleges (CT & HINDI)	70
5. (i) Higher Secondary (including Multipurpose) Higher Secondary Schools	2466
(ii) High (including Multipurpose High Schools)	N A
(iii) Middle, Senior Basic and Ashram Schools	7413
(iv) Primary Schools	32797
6. Schools for Physical Education	Nil
7. Teachers' Training School	1
8. Schools for the Handicapped	3

Table 209

Medical Facilities

	1979	*1980*	*1981*
A. Allopathic Hospitals & Dispensaries	568	570	572
Beds	11548	11683	12016
Doctors	2570	2570	2682
B. Homeopathic & Ayurvedic Hospitals & Dispensaries	433	514	545
Total number of patients treated	4328575	6137123	6658311
Medical Officers both Homeopathy&Ayurvedic	....	....	636
C. Population in 1000' served by a Medical Institution of all types (Allopathic, Homeopathic and Ayurvedic)	26.83	26.78	....

(As per the estimated mid-year population)

Tourism. Important Tourist Centres in Orissa: Bhubaneswar: Bhubaneswar, the present capital of Orissa, is known as the cathedral city of India on account of its numerous temples. A complete study of the "Kalinga Style" of architecture from its very inception to maturity spread over a period of about two thousand years is epitomised in the monuments of Bhubaneswar. Places of interest are: Lingaraja Temple, Mukheswar Temple, Ananta Basudeva Temple and Rajarani Temple, the Jain and Buddhist Rock-cut caves of Khandagiri, Udayagiri and Dhauli together with Ashok's rock edict.

Bhubaneswar is connected with Calcutta and Vizag by daily flights and New Delhi by triweekly Boeing flights. Also there are express trains to Delhi, Calcutta, Madras and Secunderabad and buses to Calcutta, Vizag, Raipur, Ranchi and Tata.

Puri: Puri (Jagannath Puri) is a coastal town and beach-resort in Orissa. It is 62 km from Bhubaneswar and is one of the four dhamas (Holy places of pilgrimage) in India—the three others being Badri-Kedarnath in the north, Rameswaram in the south and Dwaraka in the west. The presiding deities in the temple are Jagannath Balabhadra and Subhadra. Every year, in June-July (Asadha Sukla Dwitiya), thousands of devotees from all over India and abroad arrive at Puri to participate in the Car-Festival. During this festival the images of Jagannath Balabhadra and Subhadra are taken in a huge procession in three gorgeously decorated chariots drawn by ardent devotees. Puri is connected with Delhi, Madras and Calcutta with express trains and Calcutta, Ranchi, Tata, Raipur and Vizag with choicest buses. The nearest airport is Bhubaneswar.

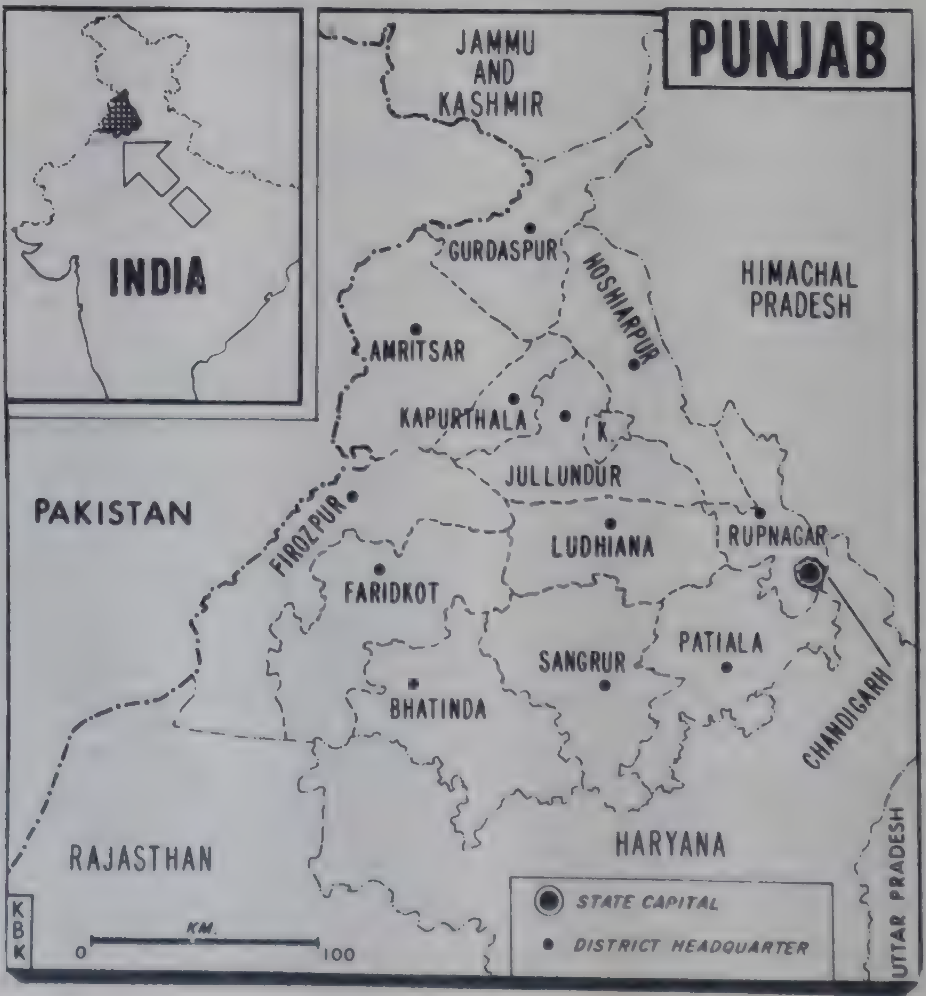
Konark: Konark is about 65 km from Bhubaneswar and 85 km from Puri. It is famous for the great temple of the Sun-God, conceived as a giant celestial chariot with twenty-four exquisitely carved wheels, drawn by seven impetuous horses. The temple is profusely sculptured with exquisite figures and figurines, fixed by an astonishing energy, trapped in stone. Standing in lone splendour amidst the sand dunes of the seashore, its greatness reveals high excellence of conception and execution. Besides the above tourist centres, the following are also interesting for the tourists.

Similipal:	— National Park
Tikarapada:	— Gharial crocodile sanctuary
Ranipur-Jharial:	— The hypaethral temple of sixty-four Yoginis
Taptapani:	— Hot spring
Atri:	— Hot spring
Deuljhari:	— Hot spring

173. PUNJAB

Physiography. Punjab is bounded on the west by Pakistan, on the north by Jammu and Kashmir, on the north east by Himachal Pradesh and on the south by Haryana and Rajasthan. Physically, the State may be divided into two parts, the sub-Shivalik Strip and Sutlej-Ghaggar Plain. The sub-Shivalik Strip covers the upper portion of Ropar, Hoshiarpur and Gurdaspur districts. The Sutlej-Ghaggar Plain embraces the other districts of the Punjab. The land is highly fertile as they are formed by the tributaries of the Indus, Ravi, Beas, Sutlej and the river Ghaggar.

History. The word "Punjab" is made up of two Persian words 'Panj' and 'Aab';



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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

Panj means five and *Aab* means water. This name was probably given to this land of five rivers possibly in an era when this region came into close contact with Persia. Prior to that period this region was known by different names at different times. Probably, when at the height of its glory it was known as Sapta Sindhu, the land of the seven rivers, namely Sindhu (Indus), Vitasta (Jhelum), Asuhi (Chenab), Purushin (Ravi), Vipasa (Bias), Satadru (Sutlej) and Saruri (Sarasvati). The last one is a dried up stream now and its traces, according to geologists, are found in the present seasonal streams that flow near Pehowa in Haryana. During the Greek occupation, the territory had shrunk into the area covering five rivers.

Punjab lies in the north west of India' Being in the way of invaders from the north, Punjab has had to take a lot of battering from the invaders. Punjab emerges into history with the coming of the Aryans into India. The Aryans in the early Vedic age apparently settled in the Punjab and its neighbourhood. In 522 BC Darius of Persia conquered the territories round about the Punjab and made them a Satrapy of Persia. In 326 BC, Alexander the Great overran the Punjab. For a time, Macedonian governors controlled the Punjab but they were defeated by Chandragupta Maurya, who annexed the entire territory. With the decline of the Mauryan empire the Scythians occupied north west India and after them, the Parthians. The Kushans came next. Thereafter the Punjab continued under indigenous rulers.

"The survey of the history of the Punjab up to the 10th century AD reveals that this region not only played an important part in the history of India but was also the meeting point of many cultures and peoples in Asia. It became a cockpit and confluence in which there was an unending amalgamation of communities and cultures inducing a pragmatic, experimental and utilitarian outlook and robust commonsense. Throughout this period, Punjab acted as the sentinel of India" (*Punjab*, Singh Gupta).

From the tenth century AD began a series of Muslim invasions culminating with Babar, the founder of the Mughal Empire. With the decline of the Mughal empire two other Muslim invaders crossed into India, Nadir Shah in 1738 and Ahmed Shah Abdali in 1748, 1750 and 1751. The Punjab had the worst of all these invasions.

The Sikh faith, which played a decisive role in the creation of a Punjabi-speaking State, came into being during a period of religious revival in the 15th and 16th centuries. It was founded as a new religious order by Guru Nanak. He was followed by nine Gurus. The subsequent 200 years witnessed the growth of Sikhism and its transformation into a militant organisation.

Guru Angad developed the Gurumukhi script by combining the scripts current in north India at that time. Guru Ram Das laid the foundation of the temple of Amritsar. Guru Arjun Dev compiled the Adi Granth. His son Guru Har Gobind started training his followers in the military art.

The intolerance shown by the Mughal emperors who succeeded Akbar was mainly responsible for the change in the Sikh attitude. Jahangir, who grew suspicious of the spreading influence of Sikhism, put Guru Arjun to death in 1606.

His son Guru Har Gobind had to undergo 12 years imprisonment in Gwalior. He had to fight four battles against the Mughals. Finally, he defeated the Imperial army of Shah Jahan near Amritsar in 1629. Guru Tej Bahadur, who succeeded Guru Har Kishan, was put to death by Aurangzeb. His martyrdom infused a new spirit among Sikhs and they organised themselves into a full-fledged military force under the leadership of Guru Gobind Singh, son of the assassinated Guru.

Guru Gobind Singh's entire life is a record of glorious heroism and supreme sacrifice. It was he who created the *Khalsa* and made the Sikhs a mighty force in India's history. He organised the first serious attempt to overthrow the Mughal Empire in the north. The Sikhs rose to the height of political glory under Maharaja Ranjit Singh. After Maharaja Ranjit Singh's death, the kingdom began to crumble. The collapse came about as a result of two Anglo-Sikh wars in rapid succession.

Punjab was annexed to British India by Lord Dalhousie in March 1849. But the spirit of the Punjab remained unvanquished. Through the centuries Punjab became the sword arm of British India.

Punjab was constituted a separate province of India in 1937. With the partition of India, Punjab was divided between India and Pakistan as East Punjab and West Punjab. On Nov. 1, 1956 the Princely States adjoining Punjab were formally absorbed into the Punjab State. On Nov. 1, 1966, Punjab was divided into three units—Punjab comprising the predominantly Punjabi-speaking areas, Haryana made up of the Hindi-speaking districts and Kharar tehsil and Chandigarh the Capital. Punjab and Haryana are now separate States while Chandigarh remains a Union Territory.

Administration. The legislature is unicameral, the Legislative Assembly. The State is divided into 12 districts.

Table 210
Districts—Area and Population

District	*Area in sq. km*	*Population (1981)*	*Headquarters*
Amritsar	5025	2167071	Amritsar
Bhathinda	5564	1294957	Bhathinda
Faridkot	5746	1429182	Faridkot
Firozepur	5923	1300778	Firozepur
Gurdaspur	3557	1502366	Gurdaspur
Hoshiarpur	3887	1230848	Hoshiarpur
Jullundur	3396	1723699	Jullundur
Kapurthala	1634	537156	Kapurthala
Ludhiana	3793	1804420	Ludhiana
Patiala	4669	1561547	Patiala
Ropar	2086	712411	Ropar
Sangrur	5096	1405320	Sangrur

Agriculture. Punjab is primarily an agrarian State and agriculture occupies the most prominent place in Punjab's economy. About 70 per cent of the people are engaged in agriculture. As against 51 per cent all India average, it has 85 per cent of its area under cultivation. Net area under cultivation is 84 per cent as against the all-India average of 42.65 per cent. Compared to all other States, the fertilizer consumption in Punjab is the highest. The efforts of the State Government to provide irrigation facilities, cheap power and agricultural inputs at subsidised rates have acted as a catalyst of agricultural production. Total production of foodgrains rose from 7.7 m. tonnes in 1972-73 to 11.91 m. tonnes in 1980-81. Production of some important crops along with the area under the crops during the year 1980-81 is given as under:

Table 211

Crops	*Production (in 1000 tonnes)*	*Area (in 1000 hectares)*
Wheat	7677	2812
Maize	605	378
Rice	3223	1178
Oil Seeds	167	220
Sugarcane (Gur)	397	72
Cotton (Bales)	1178000	650

Animal Husbandry. Animal husbandry is well developed in Punjab.

Dairy Development. Punjab has a sizeable dairy industry. There are 11 milk plants in the State in the public, private and co-operative sectors.

The per capita availability of milk in Punjab is 518 gm.

Table 212
Livestock and Poultry in Punjab 1972

Cattle	3.41 million
Buffaloes	3.89 ,,
Horses & Ponies	5.47 ,,
Sheep & Goats	12.0 ,,
Poultry	3.0 ,,

Power. The Punjab is well supplied with power. In 1978-79 installed capacity was 1541 mw. 12234 villages/towns were electrified by the end of 1980. Per capita consumption of electricity was 260 units (March 1981).

Industries. Agricultural production is now nearing the saturation point. In order to make the State more prosperous it was essential to establish industries.

In Jan. 1981 the number of registered factories in Punjab was 7347. 7053 operational factories employed about 201735 people. The chief manufactures are textiles, sewing machines, sports goods, sugar, starch, fertilizers, bicycles, scientific instruments, electrical goods, machine tools and pine oil. Altogether there were 43191 industrial units employing about 287,000 workers/employees.

There were 61,167 small scale units registered in the State by the end of 1980-81. These units employed 396217 persons and produced goods valued at Rs. 1073.62 crore. Exports fetched Rs. 82.68 crore. The number of small scale units increased by 12.9 per cent during 1980-81 over 1979-80 compared to 17 per cent during 1980-81 over 1979-80.

Education. Compulsory education was introduced in April, 1961. At the same time education was made free up to the 8th class for boys and 9th class for girls. The aim is to educate all children of the age group 6-11.

The Director of Education in the State became heavily loaded; so a separate Directorate of Colleges was established in the year 1976 Again separate Directorates for Primary Schools and High/Higher Secondary Schools were set up in the year 1978.

The pay of the teachers of Govt.-aided institutions has been brought on a par with that of teachers of Govt. institutions thereby removing the resentment prevailing among the teachers of Government-aided institutions.

The following table shows the number of teachers and scholars as on 30-3-78.

Table 213

	Primary	Middle	High	Higher secondary	Total
No. of Schools	17784	1432	2068	245	21529
No. of teachers	47959	9980	26594	3663	93196

Affiliated colleges and teaching strength as on 31-9-80.

Table 214

	Arts & Science	Trg. Colleges	Medical Colleges	Eng. Colleges	Commerce	Phy. Coll.	Other Coll.
No. of Colleges	160	18	10	2	1	2	9
No. of teachers (provisional)	4040	268	832	159	38	32	NA.

Health*. In order to improve public health efforts are being made to provide medical facilities by increasing the number of dispensaries and health centres. On 1-4-1980, 254 hospitals and 1485 dispensaries were functioning in the State. In addition to this 68 dental clinics and 129 primary health centres were also operating in the State on 1-4-81.

Communication. The total length of metalled roads on 31 March 1980 was 33288 km. State transport services cover 6.71 lakh km route daily with a fleet of 2776 buses carrying a daily average of 10.62 lakh passengers. There were 276,748 motor vehicles in 1980 as against 175,038 during 1975-76.

Tourism. The Punjab is dotted with places of historical and cultural interest. *Ropar*, one of the centres of Indus Valley Civilisation, *Amritsar*, the city of the Golden Temple, sacred to the Sikhs, the ancient fort of *Bhathinda*, the architectural monuments of *Kapurthala*, the city of Gardens, Patiala, and Chandigarh, the capital designed by the French architect Le Corbusier are among the leading tourist attractions of the State.

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* The population served per one institution, doctor, and bed (on 1-4-80) were 8992, 1976 and 817 respectively.

174. RAJASTHAN

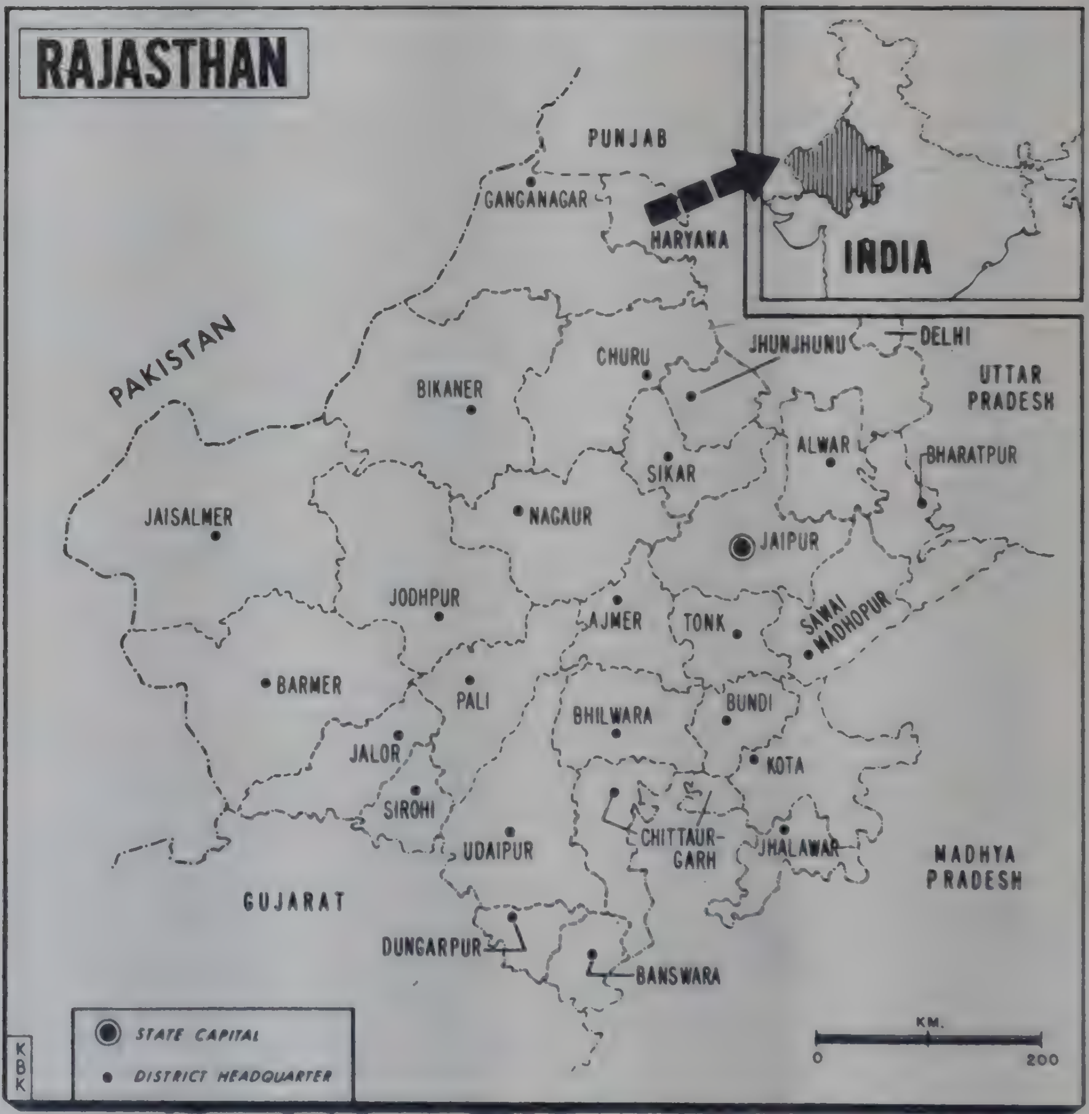
Rajasthan is one of the border States of India, sharing India's frontier with Pakistan on the west and northwest. Punjab, Haryana and Uttar Pradesh bound it on the east and north-east and Maharashtra on the south-west.

Physiography. Rajasthan is one of the few States of India that show great contrast from one area to another. This disparity is noticeable in respect of climate, soil, vegetation, mineral resources etc. However, the State may be divided into 6 regions. (1) Western arid region, (2) Semi-arid region, (3) Aravalli region, (4) Eastern region (5) South eastern region and (6) Chambal ravines.

The western arid region covers the whole of Jaisalmer district, north-western part of Barmer and Jodhpur, south-east Bikaner, south western Churu and western part of Nagaur. This region is characterised by typical desert conditions and forms the largest region in the State. The physiography is marked by vast stretches of sand dunes of different types, with rock formations peeping out here and there amid the billowing sands. This region receives hardly 10 cm of rain and is consequently the most arid region of Rajasthan.

The semi-arid region lying west of the Aravalli ranges covers the districts of Jalore, Pali, south-eastern Jodhpur and Nagaur, Sikar, Jhunjhunu and north-eastern part of Churu. The southern part of this area is watered by the Luni river while the northern part is an area of inferior drainage. Rainfall varies between 25 and 50 cm. But temperatures run high. The rain-water in the northern part collects in vast depressions or sinks into the sand. As the water evaporates it leaves behind deposits of salt and soda. Some of these depressions form salt-lakes, like Sambhar, Degana, Kuchamana and Didwana. Sambhar lake, some 25 km long and 10 km wide, at its fullest, is the largest of the salt-lakes and yields on an average 250,000 tonnes of salt per year.

The Rajasthan canal passes through the north-west portion of this region irrigating at present Ganganagar district and the north western part of Bikaner district.



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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

The Aravalli region covers almost the whole of Udaipur, south eastern part of Pali and Sirohi and the western part of Dungarpur districts. The area is dominated by the mountains of the Aravalli range and outlying hills. Gurushikar (1727 m), the highest peak in Rajasthan, is located in this region. Rainfall varies from 50 to 100 cm during monsoons. Mount Abu, in the south-western part of this area is the only health resort in the State. This region is rich in minerals—zinc at Zawar and berryllium at Bari, Sikar-bari and other places, mica, soapstone, talc and steatite in Udaipur district, emerald in Deogarh etc.

The eastern region comprises the districts of Jaipur, Ajmer, Sawai Madhopur, Bhilwara, Bundi, Alwar, Bharatpur and north-western part of Kota. It is mainly drained by Banas River and its tributaries. This region has the largest number of industries, located mainly at Jaipur, Ajmer, Kota, Bhilwara and Shahpura.

The south-eastern region embraces the districts of Banswara, Chittorgarh, Jhalawar and Kota. The Kota-Jhalawar area consists of stony uplands but the Chambal river and its tributaries have formed an alluvial basin in Kota.

The Chambal ravine region lies along the river Chambal, where it forms the boundary between Rajasthan and Madhya Pradesh. Within Rajasthan, the ravinelands run in a narrow belt ranging from 5 to 20 km in the Sawai-Madhopur and Bharatpur districts. The ravines extend into M. P. and even into U. P. upto the point where Chambal joins the river Yamuna. In this area in Rajasthan, a large number of watersheds occur during the monsoon which runs off in heavy torrents, eroding the soil all the way. This area is faced with the problem of soil erosion which has become serious enough to menace cultivated lands adjoining it.

Formation of the State. The State of Rajasthan is an amalgam mainly made up of the old princely states of Rajasthan. It took some eight years for the State to come into its present shape. The first step towards the formation of this State was taken on March 17, 1948 with the formation of the Matsya Union, a union of four princely States, Alwar, Bharatpur, Dholpur and Karauli. The second step came with the formation of Rajasthan, a Union of 9 States -Bhanswara, Bundi, Dungarpur, Jhalawar, Kishangarh, Kota, Pratapgarh, Shahpura and Tonk on March 25, 1948. The State of Udaipur joined this Union on April 18, 1948, thus transforming the Union into the United States of Rajasthan. The next two important steps were taken in 1949, the first on March 30, 1949, when the four large States of Bikaner, Jaipur, Jaisalmer and Jodhpur joined the United States of Rajasthan and the second on April 25, 1949, when the Matsya Union joined up. The new Union was known as the United States of Greater Rajasthan. The Union of Greater Rajasthan was further enlarged by the accession to it of the state of Sirohi on Jan. 25, 1950. The final step was taken when the state of Ajmer, the tehsil of Abu and the area of Sunel Tuppa were integrated with Greater Rajasthan on Nov. 1, 1956, to be known simply as Rajasthan.

Administration. The legislature is unicameral—the Legislative Assembly. The State is divided into 27 districts, 82 subdivisions and 200 tehsils.

Table 215

District	*Population 1981*	*Area in (sq. km)*	*Headquarters*
Ajmer	1440366	8479	Ajmer
Alwar	1771173	8382	Alwar
Banswara	886600	5037	Banswara
Barmer	1118892	28387	Barmer
Bharatpur	1889132	8093	Bharatpur
Bhilwara	1310379	10450	Bhilwara
Bikaner	848749	27231	Bikaner
Bundi	586982	5550	Bundi
Chittorgarh	1232494	10858	Chittorgarh
Churu	1179466	16829	Churu
Dungarpur	682845	3770	Dungarpur
Ganganagar	2029968	20629	Ganganagar
Jaipur	3420574	14000	Jaipur
Jaisalmer	243082	38401	Jaisalmer
Jalore	903073	10640	Jalore
Jhalawar	784998	6216	Jhalawar
Jhunjhunu	1211583	5929	Jhunjhunu
Jodhpur	1667791	22860	Jodhpur
Kota	1559784	12437	Kota
Nagaur	1628669	17718	Nagaur
Pali	1274504	12391	Pali
Sawai Madhopur	1535870	10593	Sawai Madhopur
Sikar	1377245	7732	Sikar
Sirohi	542049	5135	Sirohi
Tonk	783635	7200	Tonk
Udaipur	2356959	17267	Udaipur
Dholpur	583156	3000	Dholpur

Agriculture. The principal crops are jowar, bajra, maize, wheat, grams, oil-seeds, cotton, sugarcane and tobacco. A deficit State in foodgrains in the pre-independent era and during the first few post-independence years, the State achieved an all-time high in farm yield in 1967-68 (66 lakh tonnes). This abundance was followed by two years of want and unprecedented scarcity which shattered the economy of the State. The year 1970-71 proved to be a year of plenty with a production of 88.41 lakh tonnes, the highest recorded production for the State. The estimated production of food grain for the year 1981-82 was 66.30 lakh tonnes.

Production target for kharif and rabi crops for 1982-83 has been fixed at 34.00 and 53.00 lakh tonnes respectively.

Irrigation. In Rajasthan there are three main sources of irrigation, canals, tanks, and wells including tube wells. Wells and tube wells irrigate nearly 55 per cent of the total irrigated area, tanks irrigate 21 per cent. In 80-81, gross irrigated area in Rajasthan was 40.84 lakh hectares. Major irrigation projects under way include the 649-km-long Rajasthan Canal and Mahi-Bajaj Sagar; Kota Barrage, Rana Pratap Sagar and Jawahar Sagar have already been completed. Provision for Rajasthan canal in the current year is Rs. 27.50 crores.

As many as 95 minor irrigation schemes were in progress in 1981-82. About 1.61 lakh hectares of land was provided with irrigation facilities by the minor irrigation scheme up to 1980-81 in the State.

Forests. Forests are sparse and cover about 10 per cent of the total area. Teak is found in the forest but it is of inferior quality. The chief forest produce is kattha (a dye), charcoal, bamboo, gum, grass and khus.

The estimated revenue income from forests for 1981-82 is about Rs. 7.39 crores.

Animal Husbandry occupies an important place in the economy of Rajasthan. The industry provides subsidiary occupation to the desert inhabitants, especially the nomadic tribes, who depend on livestock for their livelihood.

The livestock of Rajasthan constitutes about 11 per cent of the all-India total. About 56 per cent of the camel population and about one crore of the sheep population are found in the State. There are some excellent breeds of native cattle, which are good milkers and fine draught animals.

Power. The total installed power generating capacity (including Rajasthan atomic power project) from all sources at the end of March, 1982 is 1252 MW. The number of villages electrified up to Feb. 1982 are 16122. Energised pumps number 225526.

Minerals. Rajasthan is a storehouse of minerals, which have yet to be exploited. The country's entire output of lead and zinc concentrates, emeralds and garnets are derived from the State. Besides, 92 per cent of India's gypsum, 90 per cent of silver, 75 per cent of asbestos and felspar and 20 per cent of mica are mined here. It has rich salt deposits at Sambhar and other places.

In Dec. 1981 the total estimated income from mineral revenue is 23.13 crores. Rock-phosphate was a major source of income.

Industry. Textiles, rugs and woollen goods, sugar, cement, glass, sodium, oxygen and acetylene units, pesticides, insecticides and dyes are some of the major industries. Other enterprises include the manufacture of caustic soda, calcium carbide, nylon tyre cord and copper smelting.

Rajasthan handicrafts are famous all over the world. Important handicrafts are marble work, woollen carpets, jewellery, embroidery, articles of leather, pottery and brass embossing.

Rural Drinking Water. Great stress has been laid on accelerating the rural drinking water supply programme. The World Bank Scheme for Rs. 137.00 crores for drinking water supply and sewerage was commissioned in 1980-81. Drinking water was supplied in 3500 problematic villages during 1981-82. Of the total 33,305 villages, 24,027 villages are problematic villages. As many as 11,777 were provided with drinking water up to July 1982.

Tourism. Rajasthan has several sights to offer the tourist, especially in ancient and mediaeval architecture. Places of interest are Mount Abu, Ajmer, Alwar, Bharatpur, Bikaner Jaipur, Jodhpur, Udaipur and Pali.

175. SIKKIM

Sikkim, the 22nd State of the Indian Union, is a small mountain state in the eastern Himalayas. It is bounded by Tibet on the north, Nepal on the west and Bhutan on the east. West Bengal lies to its south. It is the smallest as well as the least populous State in the Union. Sikkim is strategically important for India. It lies astride the shortest routes from India to Tibet.

Sikkim became a State of the Indian Union under the Constitution (Thirty-eighth Amendment) Act, 1975, which came into force with retrospective effect from the 26th April, 1975, when the amending bill was originally passed by both Houses of Parliament.

Physiography. The State is entirely mountainous. About a third of the land is covered with dense forests, where sal, simal, bamboo and other plants thrive. Some of the finest forests lie in the northern-most areas in Lachen and Lachung. Here the mountains rise to elevations of 7000 metres and more. Kanchenjunga (8579 m), the world's third highest peak, rises from this area. The forests here are inaccessible and remain for the most part unexploited.

On an average, Sikkim receives 125 cm rain. But the rainfall varies widely between various regions like sheltered valleys, foothills and high mountains. River Tista and its tributaries drain the State. Tista is a perennial river being both rain-fed and snow-fed.

Sikkim boasts of several hundred different kinds of orchids and is frequently referred to as a botanist's paradise.

The People. The population of Sikkim is mainly made up of the Lepchas, the Bhutias and their allied clans and the Nepalese.

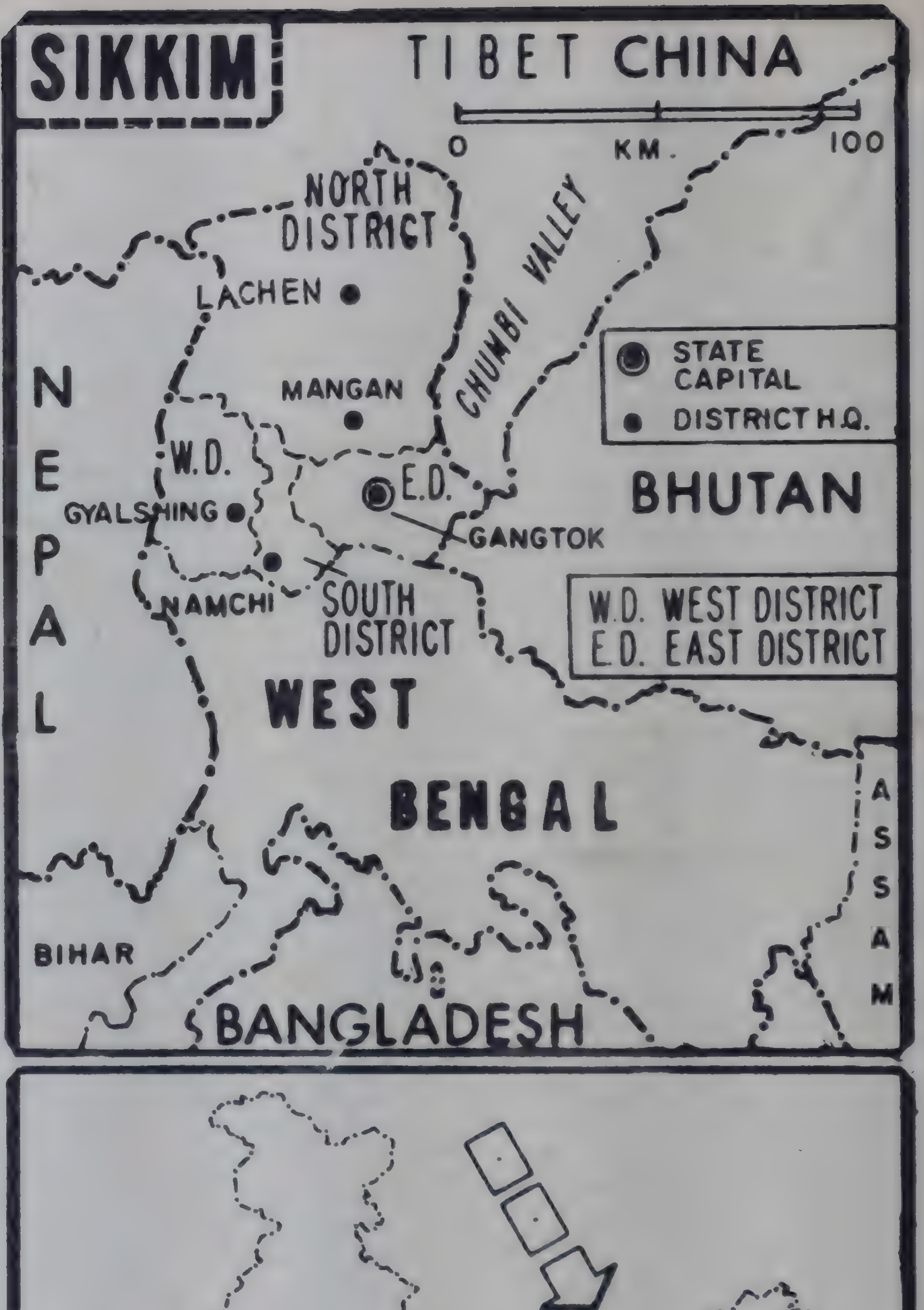
The Lepchas, who are believed to have come from Assam were the first settlers in Sikkim. The Bhutias came from Tibet in the 14th century. The Tsongs are a minority community. In the 18th and 19th centuries the Nepalese came into Sikkim and established themselves. And, today, they form the majority community in the State.

According to the 1981 Census provisional figures, the total population of Sikkim is 314,999 consisting of 171,165 males and 143,483 females. The latest community-wise distribution of the population is not yet available.

The accelerated development work in the State after she joined the Indian Union has attracted a large number of businessmen from the plains and employees from the neighbouring State of West Bengal.

Political History. It was in the 17th century that Sikkim took shape as a political entity under a Buddhist king who titled himself as Gyalpo. The first Gyalpo ascended the throne in 1642. In the 18th century, Bhutanese hordes poured into Sikkim and occupied some territory in the east. In the 19th century the Gorkhalis of Nepal occupied the western areas of Sikkim. The Gorkhalis threatened to overrun the whole State and dislodge the Gyalpo. The Gyalpo appealed for help to the British Indian Government. The British came to the rescue and drove out not only the invading Gorkhalis but also the Bhutanese who were in illegal occupation of the eastern part of Sikkim. The Sikkim King ceded the hills of Darjeeling to the British Raj (at the request of the latter) to start a sanatorium there for the British serving in the plains on the understanding that an equivalent amount of land would be given in exchange. But the relation between the Company and the ruler of Sikkim soon degenerated. The Dy. Commissioner of the Company started collecting taxes from Murang which was part of Sikkim territory and, further, created difficulties in extraditing slaves and criminals to Sikkim. It was in such an atmosphere of strained relations that Dr. Campbell and Hooker started on their exploration of Sikkim. They were detained by the Sikkim ruler in 1859 as their exploration was unauthorised. The company, incensed at the detention, sent a punitive expedition and annexed the whole of Darjeeling and Murang.

However, matters were ended amicably by a treaty in 1861, under which the Gyalpo accepted British suzerainty and Sikkim became a protectorate of the British Indian Government. In 1889 British India sent its first Political Officer to Sikkim just as it had sent Political Officers to all other Indian Princely States. The Sikkim ruler was re-designated the Maharaja and made a member of the (Indian) Chamber of



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

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Princes. Sikkim had thus in law and in fact become a protectorate of British India like all other Indian States. When India became independent the relationship that existed between the British Raj in India and Sikkim was maintained unimpaired by a standstill agreement between India and Sikkim. The agreement was replaced by a treaty on Dec, 5, 1950 under which Sikkim became a protectorate of the Indian Union.

In 1965 the ruler of Sikkim who had married an American (Miss Hope Cook) assumed the title of Chogyal, which means righteous king (literally religious king). The Chogyal's American wife became the Gyalmo.

The Chogyal set about to make Sikkim an independent kingdom with a flag and a national anthem of its own and sought to gain admittance as a member state of the U. N. as the status of protectorate was not in keeping with the times.

But on the home front, the Chogyal faced hostile demonstrations engineered by politicians. In April, 1973, the Indian army had to intervene to protect the Chogyal. Under an agreement negotiated at the instance of the Government of India, the Chogyal signed an agreement on May 8, 1973 under which new constitutional arrangements to usher in a popular government were undertaken by the Chogyal. Sikkim was to have a legislature elected every four years on the principle 'one man, one vote'. The elections were to be free. The agreement stated: "The Chogyal shall perform the functions of his high office in accordance with the constitution of Sikkim, as set out in this agreement."

The elections under the agreement were held on April 23, 1974. Three parties contested the elections, the Sikkim State Congress, the Sikkim National Party and the Praja Sammelan. The Sikkim State Congress, led by Kazi Lhendup Dorji, swept the polls capturing 31 out of the 32 seats in the National Assembly. The newly elected Sikkim National Assembly called for closer ties with India and proposed an associate status for Sikkim as a member of the Indian Union. Accordingly, the Indian Parliament adopted the Constitution (Thirty-sixth Amendment) Act, 1974 making Sikkim an associate State of the Indian Union. The associate status did not improve matters. On the contrary, it led to a confrontation between the Chogyal and the National Assembly.

On April 10, 1975 the Sikkim Assembly resolved that the institution of the Chogyal shall be terminated and Sikkim should be fully integrated with India as a State of the Indian Union. In response to this resolution, the Constitution (Thirty-Eighth Amendment) Act was passed by Parliament making Sikkim the 22nd State of the Indian Union, as from April 26, 1975.

The Dorji cabinet was dissolved in August, 1979 and the State passed under President's rule. In the general elections held in October, 1979 the Sikkim Parishad won by a thumping majority and Nar Bahadur Bhandari, leader of the Parished, took over as Chief Minister on 12th October, 1979.

The Sikkim Parishad Party, which was functioning as a unit of Congress (I) in the State formally merged with Congress (I) in July, 1981.

Administration. The State has a single-house legislature, the Legislative Assembly.

Sikkim is divided into four districts.

Table 216

Districts: Area, Population and Headquarters

District	*Area (sq. km)*	*Population (1981 Census)*	*Head-quarters*
East	950.53	138,746	GangtoK
North	4496.24	26,477	Mangan
South	699.30	75,545	Namchi
West	1152.55	74,914	Gyalshing

Agriculture. The principal crops are maize, paddy, millet, wheat and barley. Orange and cardamom are the main cash crops. Other important crops are potatoes, apples and buck-wheat.

As the majority of the population depends on agriculture for livelihood, the Governments at both the Centre and the State have accorded high priority to agriculture. High yielding strains of maize like 'Vijaya' and paddy seeds like 'Taichung' have been selected for multiplication and wheat seeds like 'Kalyansona' have been introduced for the first time. Government-owned agricultural farm in West Sikkim is credited with the distinction of achieving a record maize yield of 97 mds per acre last year. Sikkim's tea estate at Temi and Kewzing extends over an area of 500 acres whose product is exported to USSR and West Germany. Recently coffee plantation has also been started at Majitar on an experimental basis.

Animal husbandry in Sikkim consists of cattle breeding, poultry, piggery and sheep and goats farms.

The Sikkim Cooperative Milk Producer Societies federated themselves into the Sikkim Cooperative Milk Producers Union last year for better marketing. At present there are 53 registered and 18 unregistered societies in the State. Two new dairies, one at Jorethang and the other at Tadong, are coming up under Operation Flood II of the National Dairy Development Board.

A cattle breeding farm has been set up at Pangthang. In 1980–81 four new veterinary dispensaries were opened, bringing the total number of dispensaries in the State to 35.

Industry. The main industrial units are the Fruit Preservation Factory at Singtam, Sikkim Tanneries Ltd. at Majitar, Sikkim Coke Briquettes at Ranipool and Sikkim Distilleries at Rangpo and HMT watch assembly unit, Sikkim Time Corporation, which has the distinction of coming first all over India among the ancillaries of HMT by assembling the largest number of watches totalling 2.10 lakhs followed by Kerala which assembled 1.70 lakhs last year.

Recently the Geological Survey of India and the Sikkim Mining Corporation have jointly located high grade deposits of gold, silver, copper and zinc in combined form, estimated at two million tonnes,at Dickchu about 20 km from Gangtok. The Sikkim Mining Corporation has also set up a copper-zinc mining project at Dikchu.

The whole of Sikkim has been declared industrially backward and the facilities admissible to such areas, like transport subsidy, subsidy on capital investment and subsidy on interest on loan, are being extended to entrepreneurs. Thanks to the incentives offered, a number of small-scale units manufacturing consumer items like washing soap, coke briquettes, matches, candles, packing boxes and leather goods have already come into existence.

To promote traditional handicrafts, the programme of imparting training at the Government Institute of Cottage Industries in this field will be intensified. To boost production, a system of advancing materials on loan to ex-trainees has been introduced so that they would have the incentive to produce finished goods from their houses.

Tourism. The tourism in Sikkim has received a big boost in recent years. One of the most significant developments is the opening of the route from Pemayangtse to Yuksam and from Yuksam to Dzongri. This has been made possible by relaxing rules and regulations governing grant of permits to foreigners by the Central Government.

Under a crash programme of creating more accommodation for tourists, a 78-bed tourist hostel at Gangtok and a 50-bed tourist lodge at Pemayangtse in West Sikkim have been constructed. Private hotels have been encouraged to expand hotel accommodation by arranging loans for them at low rates of interest.

With the opening of a Tourist Information Centre in Siliguri (West Bengal), tourists have no longer to go to Darjeeling for getting permits for visiting Sikkim. Tourist Information Centres have been set up also in New Delhi, Bombay and Calcutta. A helicopter service has also been started between Bagdogra (West Bengal) and Gangtok, the State capital.

176. TAMIL NADU

Tamil Nadu is situated on the eastern side of the southern tip of the Indian peninsula. It is bounded on the east by the Bay of Bengal, in the west by the Arabian Sea and the States of Kerala and Karnataka, in the north by Karnataka and Andhra Pradesh. It is the eleventh largest State in India and occupies 4 per cent of the country's total area.

Physiography. The land mass of the State can be divided into two natural divisions: (i) the eastern coastal plain and (ii) the hilly region along the north and the west. The coastal plain is usually sub-divided into (a) the Coromandel plain comprising the districts of Chingleput, South Arcot and North Arcot, (b) the alluvial plain of the Kaveri delta extending over Thanjavur and part of Tiruchirapalli districts and (c) the dry southern plains in Madurai, Ramanathapuram and Tirunelveli districts.

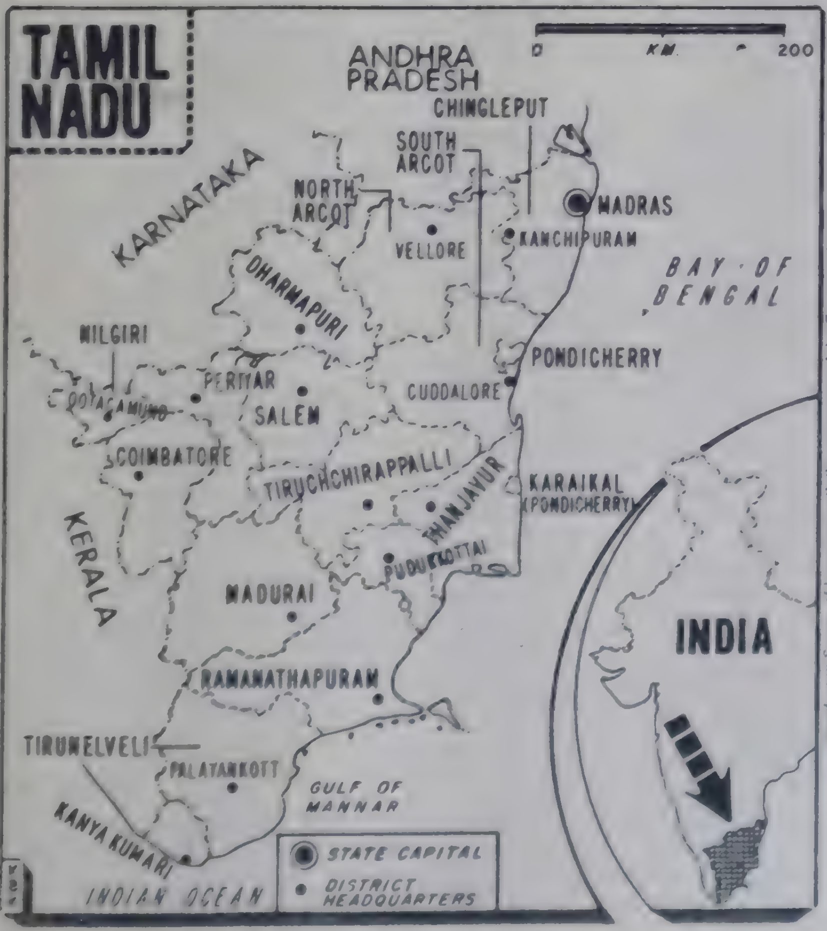
Along the whole length of the western part, at a distance from the sea varying from 80 to 160 km, runs the range of the Western Ghats, a steep and rugged mass averaging 1220 metres above the sea level and rising to 2440 metres. The Palghat Gap about 25 km in width is the only marked break in the great mountain wall.

To the south of this gap, the range is known as Anaimalai (Elephant Hills). On the east are the Palni Hills on which is situated the famous hill station of Kodaikanal. The slopes of the Western Ghats are covered with heavy evergreen forests. These slopes are the sources of the rivers Kaveri, Vaigai and Tamraparni. The Nilgiris and the Anaimalai are the hill groups with the maximum height. In the famous Ootacamund area of the Nilgiris district, the highest peak of Doddabetta is 2640 metres above the sea level.

The so-called Eastern Ghats begin in Orissa and pass through Ganjam district of Orissa and run south west through all the districts lying between Ganjam and Nilgiris plateau. Their elevation is 610 metres on the average and their highest peaks are less than 1830 metres. No river of any importance rises from these ranges in this State.

Rainfall. The rainfall in the region is determined by the south west monsoon (June to Sept.) and the north east monsoon (Oct. to Dec.). The north east monsoon is more important to Tamil Nadu than the south west. The importance of the north east monsoon sharply distinguishes the State from the rest of the country where the south west monsoon plays the major role. The districts of Chingleput, South Arcot, Thanjavur, Madurai, Ramanathapuram and Tirunelveli depend mainly on the north east monsoon. The normal rainfall is 1020 to 1140 mm in South Arcot and Thanjavur districts and 760 to 890 mm in others. The districts of North Arcot, Salem, Coimbatore and Tiruchirapalli in the central region depend on both the monsoons (north east and south west) and the rainfall is between 760 to 1020 mm. Nilgiris depends on the south west monsoon with a normal rainfall of 1520 to 1780 mm. The average rainfall in the State varies over a wide range of 640 to 1910 mm per year.

Rivers. The rivers of the State flow eastward from the Western Ghats and are



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

Based upon Survey of India map with the permission of the Surveyor General of India. © Government of India Copyright 1979 entirely rain-fed. The perennial rivers are: *Palar, Cheyyar, Ponnaiyar, Kaveri, Meyar, Bhavani, Amaravati, Vaigai, Chittar* and *Tamraparni*. The non-perennial rivers are the Vellar, Noyil, Siruliar, Gundar, Vaipar, Valparai and Varshali. The 760-km-long Kaveri is the great river of the State. Rising on the Brahmagiri, a hill in Coorg in the Western Ghats, almost near the Arabian Sea, it travels the entire breadth of the peninsula and forms a large delta at its mouth in the Thanjavur district before flowing into the Bay of Bengal.

History. Tamil Nadu has a very ancient history that goes back some 6000 years. The State represents the nucleus of Dravidian culture in India, which antedated the Aryan culture by almost a thousand years. It is generally held that the architects of the Indus Valley Civilization of the 4th millennium BC were Dravidians and that at a time anterior to the Aryans, they were spread over the whole of India. With the coming of the Aryans into North India, the Dravidians appear to have been pushed into the south, where they have remained confined. Tamil Nadu, with the other southern States, Andhra Pradesh, Karnataka and Kerala, today forms the repositories of the Dravidian culture.

The Dravida country of which modern Tamil Nadu formed a part, was reputedly under three dynasties, Chola, Pandya and Chera from the 4th century BC. The Cholas occupied the present Thanjavur and Tiruchirappalli districts and surrounding territories and excelled in military exploits. In the 2nd century BC a Chola prince, Elara, conquered Ceylon (Sri Lanka). The Pandyas excelled in trade and learning. They controlled the districts of Madurai and Tirunelveli and part of South Kerala. A Pandyan King sent an embassy to the Roman Emperor Augustus in the first century BC. The Cheras were powerful on the West Coast in what is, today, Central and North Kerala.

The Pallavas of Kanchi rose to prominence in the 4th century AD and dominated the south for another 400 years. In the sixth century they overran the Chola dominions and carried their arms as far as Ceylon (Sri Lanka). The famous Alvars and Nayanars, sage-poets, flourished during the Pallava era. In the 9th century the last of the Pallavas was defeated by the Cholas who again became a great power in the south.

In the 13th century the Pandyas became dominant. Their kingdom was a great centre of international trade. The rise of Vijayanagar spelt the decline of the Pandyas. They were ultimately defeated by Vijayanagar, and their territories were annexed to the Vijayanagar Empire. With the disintegration of the Vijayanagar Empire, Tamil Nadu was parcelled out among several petty kings.

The rise of the Muslim power in India has had its impact on Tamil Nadu, but by and large, Tamil Nadu remained unaffected by the political convulsions in north and central India. With the establishment of the East India Company at Madras in 1639, a new chapter was opened in the history of Tamil Nadu. Slowly but steadily, the whole of Tamil Nadu and most of South India came under British sway.

When India became free, the old Madras province, comprising Tamil Nadu and Andhra Pradesh and part of Kerala, continued as the State of Madras. But the agitation for a separate Andhra State compelled the Government of India to bifurcate the State into two separate States, Andhra Pradesh to include the Telugu-speaking areas and Madras, the Tamil speaking areas. The old capital Madras city was retained by the new Madras State.

Under the States' Reorganisation Act 1956, Madras lost the Malabar district and the Kasargod taluk of S. Kanara district to the newly formed State—Kerala, while Madras gained four taluks of the Trivandrum district and Shencotta taluk of the Quilon district from Kerala. The four taluks thus gained were constituted into a new district of Madras as the Kanyakumari district. The new Mysore State (Karnataka) absorbed some parts of the old S. Kanara district (excluding Kasargod taluk) and the Kollegal taluk of the Coimbatore district. In April 1960, 405 sq. miles of Chittoor district in Andhra Pradesh were transferred to Madras in exchange for 326 sq. miles from Chinglepattu and Salem districts.

On Jan. 14, 1969 Madras State changed its name to Tamil Nadu. However, the capital city is still known by its old name, Madras.

Administration. The legislature consists of two houses—The Legislative Assembly and the Legislative Council.

The State is divided into 16 districts.

Table 217

District	*Area (Sq. km)*	*Population 1981*	*Head-quarters*
Chengalpattu	7920	3611871	Kancheepuram
Coimbatore	10873	3051135	Coimbatore
Dharmapuri	9643	1993290	Dharmapuri

Kanyakumari	1684	1419110	Nagercoil
Madras	128	3266034	Madras
Madurai	12629	4530028	Madurai
Nilgiris	2549	628231	Ootacamund
N. Arcot	12265	4402087	Vellore
Periyar	4800	2057497	Erode
Pudukkottai	4137	1155684	Pudukkottai
Ramanathapuram	12578	3330339	Madurai
Salem	8643	3929822	Salem
S. Arcot	10898	4199892	Cuddalore
Thiruchirappalli	11208	3606033	Thiruchirappalli
Thanjavur	86809	4057230	Thanjavur
Thirunelveli	11433	3559174	Thirunelveli

Agriculture. Cereals dominate the agricultural sector, rice being the main crop. Among cash crops, groundnut is the most important. Sugarcane has a fluctuating acreage 1.72 lakh ha. in 1981-82. The principal plantation crops are tea and coffee.

During 1979-80 a new landmark in rice production was reached in the State with the export of 50,000 tonnes of rice to Cuba, Africa and other countries. Self-sufficiency in rice production has thus been reached with the implementation of a well co-ordinated and directed agricultural policy. The progress made in agriculture holds the key to the overall economic growth of the State.

Table 218

Agricultural Production

	Lakh hect.	*Lakh tonnes*
Rice	26.50	62.29
Millets	19.55	22.80
Pulses	13.04	3.30
Oilseeds	13.37	14.03
Sugarcane	1.72	22.70
Cotton	3.00	4.80

Irrigation. Out of 6.3 million ha. of net area sown in 1979-80, 47.9 per cent was irrigated. Major sources of irrigation are government canals 29 per cent, wells 35.4 per cent and tanks 34.3 per cent. The area of crops irrigated in the State was 3.7 million ha. Of the total area of crops irrigated, 86 per cent was under cereals and pulses, 3.8 per cent under sugarcane, 5.2 per cent under oilseeds and 3.4 per cent under cotton. The area irrigated more than once was 1.4 million ha. Nearly 95 per cent of the total available surface water potential in the State had so far been harnessed.

Animal Husbandry. Tamil Nadu has a livestock population of 24.14 million. A wide network of sophisticated units are being built up for increased production by the Animal Husbandry department. As per 1981-82 statistics, there are 552 veterinary dispensaries, 73 veterinary dispensary-cum-key village centres, 50 veterinary hospitals, 3 veterinary hospitals-cum-key village centres, 15 clinical centres, 13 clinical laboratories, 7 mobile units and 8 animal disease intelligence units.

Forestry. The total forest area in the State in 1980-81 is 2179100 ha. Out of the total area, 1783200 ha are reserved forest, and 352000 ha are unclassified forests. According to the National Forest Policy, one-third of the total area of the country should be forests. But in Tamil Nadu the percentage of area under forests is only 1.7.

The forests yield a variety of produce such as timber, firewood, green manure, resins, tan materials, essential oils, edible fruits and nuts, sandalwood, eucalyptus, rubber etc.

Wild life sanctuaries play an important role in the conservation and production of the flora and fauna. During 1979-80 the scheme of Nature Conservation was implemented at a cost of Rs. 17.20 lakhs. A sanctuary for lion-tailed Macague at Kalakodu was created. Point Calimere Wild Life Sanctuary and Mudumalai Sanctuary were developed and crocodile reservoirs at Amaravathy and Sathanur were started.

Fisheries. Tamil Nadu which stands only next to Kerala in fish production has a vast coastline of 997.47 km with a continental shelf of 77,700 sq. km and an inland water spread of 7.90 lakh hectares of culturable waters. The potential fish production from the inshore and offshore of Tamil Nadu has been estimated at over 9 lakh tonnes including the present exploitation of only 1.17 lakh tonnes, mostly confined to the inshore region.

The export of marine fish products from Tamil Nadu during 1981 valued at Rs. 29.83 crores accounts for 13.43 per cent of the total value of exports of marine fish products from our country. The per capita consumption of fish in Tamil Nadu is 7.51 kg per annum which is higher than the all-India average of 4.13 kg.

Minerals. Minerals found are salt, limestone, magnesite, gypsum, crude mica, bauxite, fire clay, lignite, iron ore etc. The State produces a large quantity of common salt from sea water. Salt alone contributes about 50 per cent of the mineral production of the State, limestone 20 per cent, magnesite 11 per cent, ilmenite 9 per cent and gypsum 6 per cent. Small quantities of bauxite and iron ore are available.

At the Neyveli Lignite Project 6.5 million tons of lignite are mined for use as fuel in a fertiliser plant and a power generation unit and for conversion into briquettes for use as domestic fuel (See Minerals & Fuels supra).

The Chalk hills between Salem and Shevaroy contain large quantities of magnesite, and the Salem deposits are the largest in the country. Gypsum reserves are found in Tiruchirappalli, Tirunelveli, Coimbatore and Chingleput districts. This mineral is used in cement and fertiliser industries. Limestone deposits are found in Tiruchirappalli, Ramanathapuram and Tirunelveli districts. This mineral is also used in the local cement factories. Ilmenite is found in Kanyakumari and Tirunelveli districts. In quality this ilmenite is poor as compared to that in Kerala.

'The Tamil Nadu Minerals' was set up in April, 1978 with a view to commercially exploiting the Black Granite and to play a major role in the mineral development of the State. Tamil Nadu Magnesite was formed in 1979 to operate the magnesite mines. Salt occupies the second position in the country in the field of production of salt.

Power. Although generation of electricity had started in Tamil Nadu as early as 1900, about five years after the first-ever Indian electricity project in Darjeeling, systematic and planned development was initiated only in 1927 with the Pykara hydro-electric project. Then came the Kaveri, Mettur and Papanasam hydel projects. On July 1, 1957, the Madras (now Tamil Nadu) State Electricity Board took over all the assets and administration of the State Department of Electricity.

The total number of villages and hamlets electrified by the end of 1980-81 was 63473 out of a total of 64198 villages.

Industry. Just like Bombay and Calcutta, the port of Madras provided the first nucleus of industrial development of the area which now forms Tamil Nadu. Tamil Nadu is today the most industrialised of the four southern States. Among all the States of India, Tamil Nadu ranks third in terms of industrial development, after Maharashtra and West Bengal.

The number of working factories in Tamil Nadu in 1979 was 9139. The number of workers in the factories increased from 5.23 lakh in 1977 to 5.73 lakh in 1979.

Education. As on 1st October 1981 there were 36,896 schools in Tamil Nadu. Out of them 27,767 were P.imary Schools, 5556 were Middle Schools and 3573 were High Schools—including 1405 Higher Secondary Schools. (The figure of 137 schools affiliated to the Central Board of Secondary Education, etc.—79 High Schools and 58 Higher Secondary Schools is also included in the total number of 36,896 schools). 2.71 lakh teachers were working in all the schools and 93.75 lakh pupils were studying in them.

There are now 187 Colleges of Arts, Science and Commerce functioning in Tamil Nadu with a strength of 1,71,100 in 1981-82 as against 1,54,700 in 1980-81.

With the constitution recently of the Bharathiar and Bharathidasan Universities, the following is the University-wise break up of the said 187 Colleges:—

Table 219

University	*Districts under its jurisdiction*	*Number of Colleges of Arts, Science and Commerce*
Madras University	Madras, Chengalpattu, North Arcot, South Arcot, Salem and Dharmapuri.	44
Bharathiar University Coimbatore,	Coimbatore, Periyar and the Nilgiris	33
Bharathidasan University Tiruchirappalli	Tiruchirappalli, Thanjavur and Pudukkottai	33
Madurai Kamaraj University	Madurai, Ramanathapuram, Tirunelveli and Kanyakumari.	77
		187

Tamil Nadu Government inaugurated its nutritious noon meal programme on July 1st, 1982. The first experiment of its kind in the country, the scheme seeks to give a nutritious meal every day of the year to some 6.6 million children constituting nearly 14% of the state's population of over 48 million. The two to ten age group accounts for 10.6 million. Of these, more than 60% live below the poverty line.

The figures of literacy percentage in Tamil Nadu as compared with the all-India figures are as follows:

		Men	*Women*	*Total*
India	1981	46.74	24.88	36.1
T. Nadu	1981	57.19	34.12	45.78

The tempo of adult education in the State is at a high level averaging about 4 lakhs of persons in 13000 centres under the various programmes.

Public Health

Table 220

Hospitals	(Modern Medicine)	377
,,	(Indian Medicine)	2
,,	(Homeopathy)	1
Dispensaries	(Modern Medicine)	659
,,	(Indian Medicine)	571
,,	(Homeopathy)	2
Primary Health Centres		385
Other Medical Institutions		163
Total Bed Strength		47897

Tourism. Tamil Nadu has very rich tourism potential. The ancient temples with lofty towers, architectural monuments, rivers, deep and lovely woods with wild life sanctuaries, unparalleled hill stations, health resorts and long beaches adorn the State. In order to cater to the needs of the foreign and domestic tourists Tourist Information Centres were opened at Delhi and at Meenambakkam airport. To promote youth tourism youth hostels are being run at important tourist places. The Tamil Nadu Tourism Corporation has been established to look after the commercial aspects of tourism.

Places of tourist interest are:—

Cape Comorin (Kanyakumari), the land's end of India, where the Arabian Sea and the Bay of Bengal meet and mingle; *Conjeevaram*, one of the 7 holy cities of India, a town with 1000 temples; *Coonoor*, a hill station and health resort; *Kodaikanal*, another famous hill station; *Kotagiri*, a minor hill station; *Madras*, the capital city of Tamil Nadu; *Madurai*, one of the ancient cities of India; *Mahabalipuram*, 37 mile from Madras, famous for its monolithic rock-cut shrines and shore temple; *Ootacamund*, the queen of hill stations and a popular summer resort; *Rameswaram*, one of the four important centres of pilgrimage in India; *Srirangam*, an island on the River Kaveri; *Thanjavoor*, the granary of the south and the delta of the Kaveri; and *Tiruchirappalli*, (Trichinopoly), the third largest city in T. Nadu and an industrial centre which is famous for its Rock Temple standing on a rock rising 260 feet above the city.

Kurusadai Island, a biologists' paradise located near Rameswaram, is reached by boat from Mandapam by Marine biologists and international tourists interested in biological study.

Pichavanam is a place of unparalleled scenic beauty. It is about 13 km from Chidambaram. It is an ideal place for boating, fishing, water skating, surfing etc.

Elegiri hills in N. Arcot district is an attractive tourist centre visited by the tourists throughout the year.

Hogenakkal waterfalls is one of the main tourist attractions in Dharmapuri district. It is famous for the curative powers of its waters.

Courtallam, famous for its waterfalls, is a well known holiday-cum-health resort.

177. TRIPURA

Tripura is the second smallest state in India. It was formally declared a Union Territory on Nov. 1, 1957 and elevated to the status of a State on Jan. 21, 1972.

Topography. Tripura is surrounded by Bangladesh on all sides, except for a narrow neck in the north east, where it borders on Assam and Mizoram. About 60 per cent of the state is hilly and the rest forests. The hills slope from east to west. Most of the natural forests are located in the western regions of lower elevation.

Originally a princely state, Tripura was merged into the Indian Union on Oct. 15, 1949. As a princely state, its population was mostly tribal. But with the partition of India and the communal holocaust which broke out, refugees from East Bengal swarmed into the State. This was the start of a massive influx of Bengalis into Tripura. Unsettled conditions in East Pakistan which finally led to the birth of Bangladesh in 1971 touched off another massive immigration into Tripura. By 1971, the demographic table has been turned upside down. The tribals who outnumbered 'others' in 1921 found themselves swamped by 'others' in 1971. This will be clear from a casual glance at the census figures from 1921 to 1971. In 1921 the tribals outnumbered 'others' by about 38,000. In 1971 the 'others' out-numbered the tribals by as many as 6.55 lakhs.

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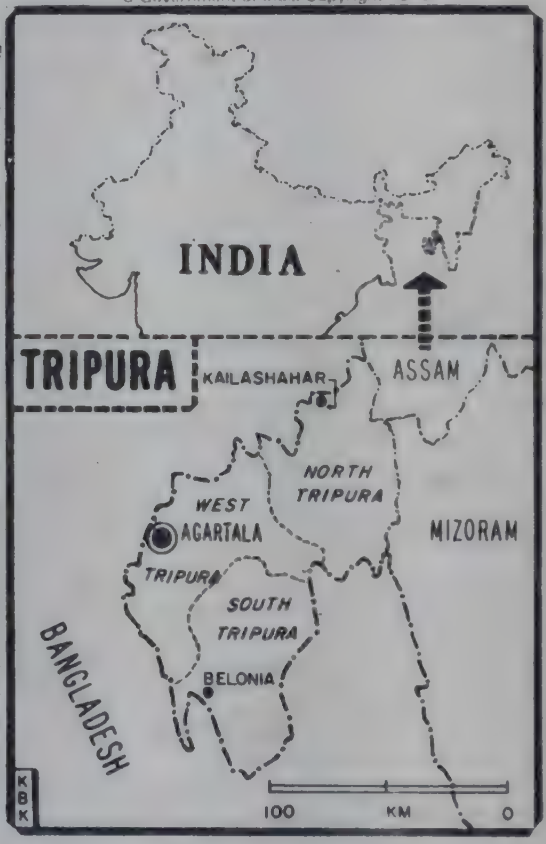


The territorial waters of India extend into the sea to a distance of twelve nautical miles from the appropriate base line

The languages of the people are Bengali, Kakbark and Manipuri.

Administration

Legislature. The legislature is unicameral —the Legislative Assembly.

Tripura is divided into three districts, 10 administrative sub-divisions and 177 tehsils.

Table 221
Districts, Area, Population and Headquarters

District	*Area sq.km*	*Total Population 1981*	*Head-quarters*
N. Tripura	3541	....	Kailashahar
S. Tripura	3577	....	Udaipur
W. Tripura	3359	....	Agartala
Tripura	....	2060189	....

Agriculture. About 60 per cent of the land is under forests. Only 23 per cent area is available for agricultural use and other purpose out of which 0.2470 million hectares can be put under field crops. The principal crops are paddy, wheat, jute, mesta, sugarcane, potato and oil seeds. 3142, 3784 and 5300 hectares of land have been brought under different soil conservation treatment during 1978-79, 1979-80 and 1980-81 respectively. Consequent upon acceptance of modern technology in most of the cases by the cultivators, the overall production of cereals was increased by about 15 per cent in the year 1981-82 over that of 1976-77.

Irrigation. The irrigation potential by permanent schemes has been increased from 2831 hectares on 1.4.78 to 9839 hectares on 1-12-81. The target fixed for the sixth five-year plan is 10,000 hectres from minor irrigation and 3500 hectares from medium irrigation for a total of 13,500 hectaress during 5 years.

In the medium irrigation sector 3 nos projects on rivers, Gumti, Khowai, and Manu estimated to cost of 1000 crores, have been approved by the planning commission.

Forests. Total area of Reserved forest and proposed Reserved forest is at present 3864.71 sq.km and that of protected forest is 2057.32 sq.km. The extent of natural tree forests is a little more than 372 sq. km which is 8.52 per cent of the total forest area. Total afforestation till 1982 is 71232 hectares. 2210 families were given financial assistance under social afforestation scheme in 1981-82. Plans for raising plantations of various economic species were made at the commencement of the 1st five-year plan and by 1980-81, 65698 hectares of plantations of various economic species have been raised. Rubber plantation has also been taken up extensively in Tripura since 1964-65 and till 1980-81 2739.14 hectares of land has been brought under rubber. The plantaion created upto 1980-81 forms 16.97 per cent of the total reserved forest area in the State and is the highest in India.

Tea. There are 56 registered tea gardens in Tripura covering an area of 5527 hectares and producing 45 lakh kg of tea per year. This industry has been employing about 10,000 workers. The Tea Development Corporation has been floated recently in Tripura to look after the interest of tea industries and to raise new gardens. Three Co-operative Societies have taken up new plantations in different places in Tripura.

It is proposed to establish a blending-cum-packaging unit and a tea auction centre within the State in the near future.

Animal Husbandry. According to the 1977 census, Tripura had:

(1) Cattle—592,204. (2) Buffaloes—14,319. (3) Sheep—2894. (4) Goats—198,634. (5) Pigs—44,963. (6) Horses & Ponies—384. (7) Others—62.

The poultry population was as follows:

(1) Poultry—521,244. (2) Ducks—116,197. (3) Other species—27,647.

Paper Mill. It is proposed to set up a paper mill in Tripura. The estimated cost of the project is about Rs. 100 crores. The site of the mill has been selected at Fatikroy near Kumarghat in North Tripura district. The project will create employment for about 20,000 persons directly and indirectly.

Power. The work of Gumti-Unit-III is going on in full swing which is expected to be completed soon. To increase reliability, 33 KV lines and Sub-Station work are in progress in Kamalpur, Khowai, Sabroom, Belenia and Amarpur. Quite a few project reports have been proposed and are under submission to G. L. A. and R. E. C., the important one being Gas thermal power house at Barmamura to make good substantial shortfall and ensure power supply during maintenance work at Gumti. No. of villages electrified upto Sept. 1981 was 1013. Annual revenue is Rs. 130.00 lakhs.

Minerals. The ONGC is carrying out exploratory drilling in different places of the State. The wells drilled so far have indicated presence of superior quality of natural gas. White and grey-coloured plastic clay, silica and limestone have also been located in the State.

Industry. Tea is the major industry in Tripura. There are 586 tea gardens covering an area of 5527 hectares and producing 45 lakhs of tea per year. This industry has been employing about 10,000 workers. These workers' Co-operative Societies have taken up new plantations in different places of the State. It is proposed to establish a blending-cum-packing unit and a tea auction centre within the State. A jute mill has been set up in Agartala under the public sector. The jute mill will produce about 1200 tonnes of packing and hessian and will employ about 2000 persons.

Village and Home Industries. The small scale industries which have been functioning in the private sector and public sector are aluminium utensils, steel furniture, washing soap, R.C.C. spun pipes, tyre retreading, rubber solution, leather goods, polythenes, plywood, fruit canning, candle, and oil mills. A steel rerolling mill with a capacity of about 6000 mt. of rolled steel products such as rods, bars and light angle iron has been established.

Handloom is the single largest industry in the State and weaving is essentially a tribal household industry. In 1980-81 handloom products worth Rs. 100 million were produced. Nine pilot centres are running in different parts of the State for imparting training in improved techniques and producing quality goods. In 1980-81 products valued at Rs. 1.5 crores were sold. In order to organise the whole industry in collective production and to streamline Govt. assistance, apex weavers' societies have been established. The area under cultivation of mulberry is about 900 acres and production of cocoon is estimated to be 5000 kg per year. A design centre on handicrafts is functioning at Agartala. During 1980-81 products worth of Rs. 60 lakhs were sold by the Handloom and Handicrafts Development Corporation.

Handicrafts. Tripura is famous for its beautiful handicrafts, particularly those for cane & bamboo. A good number of master craftsmen of this State have received national awards for their outstanding crafts. About 5000 persons are engaged in the industry at present. The industry is being commercialised under the active patronage of the Government.

Labour & Employment. In 1979 there were on the register of Employment Exchanges a total of 48,577 males and 18,711 females. They comprised many categories of workers—skilled and unskilled, clerical, domestic, supervisory personnel and teachers. Of these 2977 men and 847 women or a total of 3851 persons were provided with employment in various sectors—Central government, State government, Local Bodies and other establishments.

Communications. Tripura, like other States of the North East, has very poor transport communications. The only National Highway is the Assam-Agartala Road. The State highway has a total length of 136 km connecting Agartala, Udaipur and Sabroom. In 1976 other motorable roads covered a total distance of 2643 km. Of the total road length only 199.6 km was surfaced.

Public Health. Before independence there were very few facilities for medical care. There was one 43-bed hospital at

Agartala and 29 dispensaries. During the last two decades considerable progress has been made in extending medical care.

Table 222

Hospitals and Dispensaries

Hospitals	12
Dispensaries	119
P.H.C.	26
Doctors	297
Homeopathic Disp.	7
Antenatal clinic	1
Eye clinic	1
Dental clinics	3
Chest clinic	1
E.N.T.	1
V.D.&Skin Disease clinic	1
Nurses	459
Compounders	176
Beds	1357
Ayurvedic Disp.	2
Psychiatric clinic	1
Orthopaedic clinic	1
Leprosy control Units	2
S. E. T. Centres	20
Urban Leprosy clinics	2
Re-constructive surgery unit	1

Literacy & Education. The State has a literacy percentage of 41.58, higher than the national average (36.17).

Table 223

Educational Institutions

Category	*No. of Institutions*	*Students*
Nursery including Balwadi Centres	590	31141
Primary Stage Schools	1572+(313)	209836
Middle Stage Schools	292+(144)	51418
High Stage Schools	92+(52)	21238
H. S. (+ Stage) Schools	52	6202
Colleges for General Education	6	7772
Colleges for professional & Technical Education	9	1346
Social Education centres	859	15434

Tourist Centres: Tourist Centres in the State are Neermahal, Sepahijala, Matarbari and Doombur Lake, Kamalasagar and Jampaihill. Two tourist coaches are plying regularly in different places of tourist interest. Directorate of Information, Cultural Affairs & Tourism arranges conducted tour thrice a week.

178. UTTAR PRADESH

Uttar Pradesh is the most populous state in India. In area, it ranks fourth, after M.P., Rajasthan and Maharashtra. It covers about 9 per cent of the total area of India.

Physiography. Uttar Pradesh is bounded by Tibet and Nepal in the north, Himachal Pradesh in the northwest, Haryana in the west, Rajasthan in the southwest, Madhya Pradesh in the south and southwest, and Bihar in the east.

Uttar Pradesh can be divided into three distinct regions: (i) northern mountains, (ii) southern hills and plateau and (iii) the Ganga plain.

(i) The lofty Himalayas embraces Uttar Kashi, Chamoli, Pithoragarh, Tehri-Garhwal, Garhwal and Almora districts, Nainital tehsil of Nainital district and Chakrata tehsil and a part of Dehra Dun tehsil of Dehra Dun district in the north, covering about one-sixth of the total area of the State.

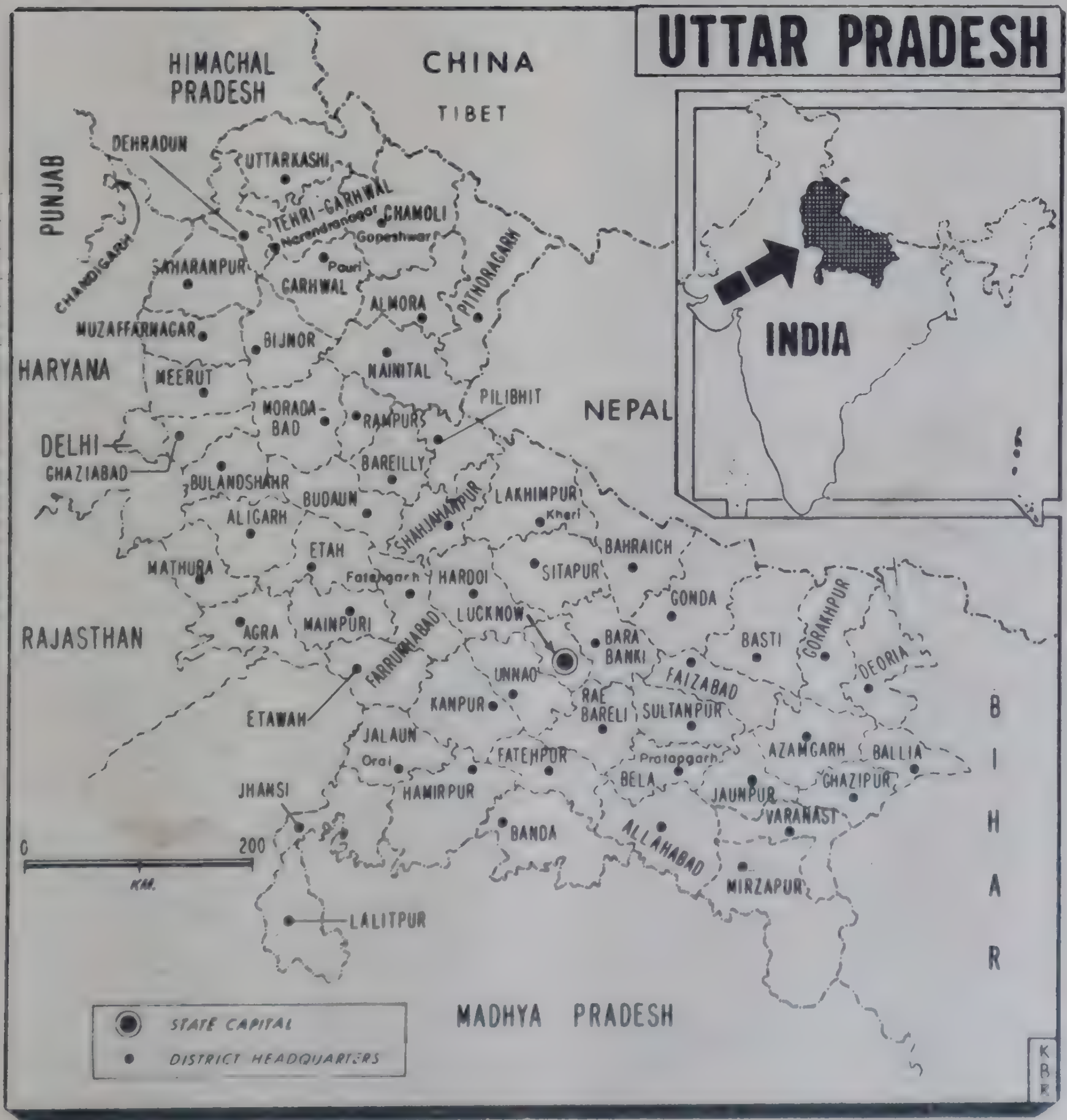
The Himalayas rises from a height of 300 metres to a magnificent series of snow-clad peaks more than 6000 metres above the mean sea level in the north. The region is deeply cut by the headwaters of the Yamuna, the Ganga, the Ramganga, the Sarda and their tributaries. Apart from the valleys, the region displays a highly dissected and rugged topography which has rendered some areas almost inaccessible.

(ii) This region covers almost the whole of Jhansi, Jalaun, Hamirpur and Banda districts, the Meja and Karchhana tehsils of Allahabad district, nearly the entire Mirzapur district, south of the Ganga river, and the Chakia tehsil of Varanasi district. The altitude in this area does not generally exceed 300 metres above the mean sea level, though in some places, it goes as high as 450 metres. The general slope is towards the north east. The Vindhyachal range traverses the Karwi tehsil of Banda district.

(iii) Between the Himalayas in the north and the hills and plateau in the south lies a vast homogeneous alluvial plain, one of the largest in the world. Because of the deep alluvium strata the region is almost devoid of minerals, which partly accounts for the very insignificant industrial development of UP. On the other hand, its high fertility has led to heavy pressure of population on land. The northern strip of the plain is called *bhabhar* and *terai* and possesses some distinctive features of its own. The *bhabhar* land is porous and is covered largely with dense forests. Below the *bhabhar* lies the *terai*, a belt formed by the deposition of the finer material of the rivers. The *terai*, except where reclaimed, is covered with dense jungle and tall grass, but the forest products have not been fully exploited yet.

The State has a tropical climate except for the Himalayan region which has a temperate climate. The average temperature varies from 8 degrees C in January to 42 degrees C in May. The average annual rainfall in the State (excluding the northern mountainous region, for which observational data are not available) is 940 mm. The rainfall decreases from east to west and from north to south. Practically no part of the State receives rainfall less than 500 mm. More than 85 per cent of the rainfall occurs during June to September. There is some rain in winter, which is useful for rabi crops.

Rivers. The main rivers of the State from west to east are the Yamuna, Ganga, Ramganga, Gomati and the Ghaghara. All the rivers, except the Gomati, emerge from the Himalayas. The Yamuna and the Ganga flow from the north-east to the south-west in their upper mountainous courses, from



the north to the south in western parts of the State and thereafter from the north-west to the south-east, joining at Allahabad.

The Yamuna is served by a number of tributaries. Its main tributaries are Chambal, Sind, Betwa and Ken which join it from the south after flowing through the southern hills and plateau region. The Ramganga joins the Ganga near Kannauj. The Gomati rises in Pilibhit district and joins the Ganga beyond Varanasi. Sarda and Rapti are the tributaries of the Ghaghara river which flows from the north-west to the south-east in the north-eastern part of the State and joins the Ganga in the easternmost extremity of the State. Eventually all rivers flow into the Ganga.

Most of the rivers of UP rank among the largest of the country. In sharp contrast to many of the other rivers of the country, most of the rivers of UP are snow-fed and hence the flow of water is perennial and massive even during the lean season. Few other parts of the country enjoy a similar advantage.

History. Uttar Pradesh has a very ancient and colourful history. Although the country does not find mention in the Rig Veda, it is recognised in the later vedic age as Brahmarshi Desa or Madhya Desa. Many of the great sages of the Vedic times like Bharadwaja, Yajnavalkya, Vasishta. Viswamitra and Valmiki appear to have flourished in UP. Many sacred books of the Aryans were also composed here. Varaha Purana, for example, is associated with Mathura.

The two great epics of India, the Ramayana and the Mahabharata, appear to have been inspired by UP. The Ramayana features the royal family of Kosala and the Mahabharata centres round the royal family at Hastinapura, both in Uttar Pradesh.

In the 6th century BC, UP was associated with two new religions, Jainism and Buddhism. Mahavira, the founder of Jainism, is said to have breathed his last at Doora in UP. It was at Saranath, again in UP, that the great Buddha preached his first sermon and laid the foundations of his order. In the post-Buddhist period several centres in UP, like Ayodhya, Prayaga, Varanasi and Mathura became reputed centres of learning. Sri Sankaracharya, the great Hindu reformer established one of his ashrams at Badrinath in UP.

In the mediaeval period UP passed under Muslim rule and led the way to a new synthesis of Hindu and Islamic cultures. Ramananda and his Muslim disciple Kabir, Tulasidas and Birbal, and many other intellectuals contributed to the growth of the vernacular languages, Hindi and Urdu. Urdu remains the perfect synthesis of Hindu and Muslim cultures.

Uttar Pradesh kept up its intellectual leadership under the British administration. The British combined Agra and Oudh into one province called the United Provinces of Agra and Oudh. The name was shortened to United Provinces in 1935. After independence in January 1950, the United Province was renamed Uttar Pradesh.

Administration

Legislature. The State has a bicameral legislature—the Legislative Assembly and the Legislative Council.

The State is divided into 56 districts as under:

Table 224

Area, Population and Headquarters of Districts

District	*Area (sq. km)*	*Population‡*	*Headquarters*
Agra	4805	2852474	Agra
Aligarh	5019	2565450	Aligarh
Allahabad	7261	3780665	Allahabad
Almora	5385	772594	Almora
Azamgarh	5740	3532876	Azamgarh
Bahraich	6877	2221154	Bahraich
Ballia	3189	1926267	Ballia
Banda	7624	1536349	Banda
Bara-Banki	4401	2012576	Bara Banki
Bareilly	4120	2264770	Bareilly
Basti	7229	3576783	Basti
Bijnor	4849	1925637	Bijnor
Budaun	5168	1964094	Budaun
Bulandshahr	4352	2349530	Bulandshahr
Chamoli	9125	364287	Chamoli
Dehra Dun	3088	757259	Dehra Dun
Deoria	5445	3487350	Deoria
Etah	4446	1837575	Etah
Etawah	4326	1748737	Etawah
Faizabad	4512	2369626	Faizabad
Farrukhabad	4274	2002513	Fatehgarh
Fatehpur	4152	1572770	Fatehpur
Garhwal	5440	624259	Puri
Ghazipur	3327	1941516	Ghazipur
Gonda	7352	2838305	Gonda
Gorakhpur	6273	3795735	Gorakhpur
Hamirpur	7166	1194114	Hamirpur
Hardoi	5986	2293994	Hardoi
Jalaun	4565	987432	Orai
Jaunpur	4038	2527012	Jaunpur
Jhansi	5024	1133002	Jhansi
Lalitpur	5039	587290	Lalitpur
Kanpur	6176	3790549	Kanpur
Kheri	7680	1962826	Lakhimpur
Lucknow	2528	2017172	Lucknow
Mainpuri	4343	1724057	Mainpuri

Meerut	3911	2766496	Meerut
Gaziabad	2590	1866778	Gaziabad
Mathura	3811	1543568	Mathura
Mirzapur	11310	2033834	Mirzapur
Moradabad	5967	3151044	Moradabad
Muzaffar Nagar	4176	2288410	Muzaffar Nagar
Pilibhit	3499	1006336	Pilibhit
Pithoragarh	8856	479600	Pithoragarh
Pratapgarh	3717	1807252	Bela
Rae-Bareli	4609	1888181	Rae-Bareli
Nainital	6794	1133111	Nainital
Rampur	2367	1177022	Rampur
Sahjahanpur	4575	1648659	Sahjahanpur
Saharanpur	5591	2673653	Saharanpur
Sitapur	5743	2338101	Sitapur
Sultanpur	4436	2037783	Sultanpur
Tehri-Garhwal	4421	493245	Narendranagar
Unnao	4558	1826463	Unnao
Uttar Kashi	8016	190571	Uttar Kashi
Varanasi	5092	3696768	Varanasi
U. P.	294413	110885874	

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‡ Provisional

Source: Research and Reference Section, Information & Public Relations Department, Government of Uttar Pradesh.

An analysis of the population of the State shows that it has the largest population belonging to the Scheduled Castes in India both in absolute figures and in percentage. The impact of this high number on the economy of the State, according to J. P. Chaturvedi "is reflected in the economic and social complexion of the State and........in poor returns, poor health, low living conditions and low rate of literacy."

Agriculture. The State is the largest producer of food-grains and oil-seeds in the country. It leads all States in the country in the production of wheat, maize, barley, gram, sugar-cane and potatoes.

Major Crops. Among food crops, wheat, rice, gram, maize and barley are important in the State. Wheat accounts for over 41 per cent of the State's total foodgrains production. In fact, the State produces about one-third of the country's total wheat output. About half of the country's barley output is produced by this State. It produces more than one-third of the country's total production of grain and gur. All in all, UP produces about 20 per cent of the country's total foodgrains.

Among cash crops, the share of this State in the all-India production of rapeseed and mustard is more than three-fourths. The State produces more than two-fifths of the total sugar-cane (gur) out-turn in the country. Of the total production in the country, this State alone produces a little over one-third of the linseed and one-fourth of the sesamum output. Jute and tobacco are also produced in large quantities. During the year under review the State produced about 1 lakh bales of jute.

Irrigation. In 1979-80, in spite of the unprecedented drought, a record irrigation of 54.5 lakh hectares was achieved through State irrigation works including canals and tubewells. A remarkable feature of the year was the construction of 50,000 'Guls' so as to avoid wastage of canal and tubewell water.

It has been proposed to utilise 126 lakh acre-feet of ground water during the VI plan. Thus approximately 625 lakh acre-feet of ground water will be utilised during the VI Plan. In 1978-79 & 1979-80 about 46 lakh acre-feet of ground water was utilised for irrigation purposes in the State.

Animal Husbandry. Next to crops, animal husbandry is the most important economic activity in the agricultural sector. With about 9.6 per cent of the country's total area, UP supports about 14 per cent of the total livestock population of the country. In 1978 the State accounted for 261.20 lakh cattle, 125.92 lakh buffaloes, 2.30 lakh horses and ponies, 66.10 lakh goats, 19.56 lakh sheep and 39.20 lakh poultry.

Fisheries. Fisheries development programme started in the State in 1944 when it had become necessary to supply fish to the armed forces. The annual average output of fish has now gone up. The bulk of the catch is exported to W. Bengal. There is 11.65 lakh ha of water area including lakes, rivers, canals and streams in the State, out of which nearly 3.24 lakh ha consist of confined waters. A total of 1.413 lakh ha is under pisciculture.

The total production of fish during 1979-80 was 17792.34 quintals. There was also an increase in the production of Fingerlings from 301.45 lakh in 1978-79 to 326.91 lakh in 1979-80.

Forests. Forests are one of the richest natural resources of the State. The total area under forests in UP is about 51,136 sq. km (1978 estimate), which covers 17.37 per cent of the total land area of the State. The national forest policy envisages a minimum of 33.3 per cent of the total land area to be under forests, UP obviously falls short of the national minimum.

Most of the forests are in the Himalayan region and in the Bhabhar and the Terai areas of the Ganga plain. The forests in the State are yet to be exploited intensively so as to increase their productivity and to meet the chronic shortage of timber, firewood and fodder and of other raw materials for forest-based industries.

The forest Department is fully alive to this situation and is taking effective steps to conserve and develop forest areas and to increase their yield, e. g. to overcome the shortage of paper & pulp in the country.

Up to the end of 1978-79 an area of over 1,57,791 ha. eucalyptus, bamboo & poplar plantations was covered. During 1979-80 against the total target of 5800 ha and an outlay of Rs. 131.00 lakh, an additional area of 4513 ha was covered at an expenditure of Rs. 131.29 lakh during the year 1979-80.

Minerals. The minerals found in U. P. include limestone (in Dehra Dun, Tehri-Garhwal, Almora, Pithoragarh and Mirzapur districts); magnesite and soapstone (in Almora, Pithoragarh districts and in some parts of district Chamoli); dolomite (in Mirzapur, Banda, Tehri-Garhwal, Dehra Dun and Almora districts); copper (in Chamoli, Garhwal Tehri-Garhwal, Almora, Nainital, Pithoragarh and Lalitpur districts); gypsum (in Dehra Dun, Tehri-Garhwal, Garhwal, Nainital, Hamirpur and Jhansi, districts); extensive deposits of low to medium grade rock phosphate (in Dehra Dun and Tehri-Garhwal districts); disporepyrophyllite (in Jhansi, Lalitpur and Hamirpur districts); bauxite (in Karvi Tehsil of Banda district); coal (in south western parts of Mirzapur district), mica (in Tehsil Thaliasen of Pauri-Garhwal district); fireclay (in south western parts of Mirzapur district) and low grade iron ore (in Mirzapur and Lalitpur districts).

Besides the above-mentioned mineral deposits, andalusite is also available in district Mirzapur; barite in Almora and Tehri-Garhwal and Lalitpur districts; asbestos in Chamoli district; radio-active minerals, such as uranium in Lalitpur, Garhwal and Chamoli districts; gold in Lalitpur and Bijnora districts; felspar in Jhansi district; alum in Nainital and Almora districts; antimony in Chamoli district; arsenic in Garhwal district; graphite in Almora and Hamirpur districts; vermiculite in Banda district; smithsonite in Dehra Dun district; shillite in Almora district; lead and zinc in Krolls district, Dehra Dun, Tehri-Garhwal and Gairsen, Chamoli districts; diamonds and calcite in Mirzapur district.

The number of mineral concessions granted in the State presently are 243, mainly consisting of limestone, gypsum, marble, disporepyrophyllite, mangnesite, soapstone, bauxite, silica-sand and rock-phosphate etc. Many industries based on these minerals have been set up and more are being planned. Besides this, a large number of mineral concessions are granted in the form of permits and auction of minor minerals. In 1976-77 Government earned a revenue of Rs. 1,452,363,740 from royalties on minerals.

Power and Rural Electrification. UP increased its installed capacity from a mere 197 MW in 1960-61 to 3182 MW in 1978-79.

The generation of electricity increased from 96,300 million units in 1976-77 to 10,129 million units in 1978-79. Along with this, the number of villages and Harijan basties electrified in the State increased from 33,358, and 9005 during 1976-77 to 36,215 and 12,358 respectively, during 1978-79. The number of private tubewells energised also increased from 253,732 during 1976-77 to 307,455 during 1978-79.

The number of consumers increased from 1,713,534 during 1976-77 to about 19 lakhs during 1978-79. The draft five-year plan for the period 1978-83, as prepared by the U.P. State Electricity Board, envisages an addition of 2606 MW in installed capacity of power, laying of 8646 km of main transmission lines, electrification of 26,460 villages and 25,300 Harijan basties and energisation of three lakh private tubewells and pump sets.

In the State, Hydel Power Generation accounted for 1068 MW and Thermal Power Generation for 2077 MW on 31 March, 1980. As many as 38,577 villages and 14,094 Harijan Basties were electrified by March 1980 and 344,145 private tubewells and 17,503 government tubewells were also energised. Power is now supplied to 2,081,942 consumers.

Industries. Until recently the organised industrial sector of the State was confined to agro-based industries such as sugar, cotton textiles, edible oils, miscellaneous food preparations, paper etc. However, of late, electricity generation, railroad equipment, electrical machinery, basic industrial chemicals, aluminium and cement factories have sprung up in the State.

Sugar, cotton textiles and miscellaneous food preparations (mainly comprising edible oils including hydrogenated oils) are the three important industries in the large scale sector of the State.

Till December 1978, 1177 industrial licences were issued by the Govt. of India.

In the large and medium industries sector, so far 1194 licences with an investment of Rs. 1932 crores were issued. During 1978–79, 26 licences involving an investment of Rs. 176 crores have been implemented.

The new cement factory at Kajrahat in Mirzapur district is expected to go into production in December 1980.

Handlooms form the largest cottage industry in the State. It provides employment to about 15 lakh persons and meets nearly one-third of the total requirement of cloth in the State. During the V Plan, 9588.14 lakh metres of handloom cloth were produced. During the year 1978–79 upto Dec. 1978 the production of handloom cloth was 2223 lakh metres.

With a view to providing yarn to handloom weavers, UP State Textiles Corporation has already set up ten spinning mills including two co-operative spinning mills.

There is a sound in-built climate available for industrialisation in UP. The State is exploiting this advantage to accelerate the pace of industrial growth so as to catch up with other industrialised States of India.

Table 225

Education: Recognised Educational Institutions in UP

Institutions	*1960-61*	*1978-79*	*1979-80*
Universities	9	20	20
Degree Colleges	128	370	380
Higher Secondary Schools.	1771	4671	4953
Senior Basic Schools	4335	11428	13127
Junior Basic Schools	40083	69244	70292
Nursery Schools	73	125	125

Note: Aligarh and Banaras Universities in the State are Central Universities under the Government of India.

Keeping in view the aim of promoting and strengthening national integration, arrangements have been made for teaching South Indian languages at 10 centres in the State. Regular examinations are conducted by the Registrar, Departmental Examinations, UP.

Health & Family Welfare. The State has 9 Medical Colleges including 2 Medical Colleges functioning in the Central Universities of Banaras and Aligarh. The State Medical Colleges are at Lucknow, Agra, Allahabad, Kanpur, Meerut, Jhansi and Gorakhpur. The total intake capacity of the Central and State Medical Colleges is 908 at present. In some of the Colleges upgrading of various departments has been completed and various new courses introduced.

The number of hospitals/dispensaries, including Public Health Centres at the beginning of the Third Plan was 1889. At present their number is 2876. There were 26374 beds in different hospitals at the beginning of the III plan; they increased to 51329 in 1978.

There are 294 State Homeopathic dispensaries in the State.

At present, there are 9 Ayurvedic and 3 Unani Colleges in the State. These colleges are imparting 5-year degree course in the respective disciplines. At present 1589 Ayurvedic/Unani dispensaries are functioning in the State.

Tourism. Uttar Pradesh has a treasure of rare scenic beauty spots, rich fauna and flora, ideal health resorts, high mountain peaks, fascinating rivers and captivating valleys.

The world-renowned Valley of Flowers, Yamunotri, Gangotri, Kedarnath, Badrinath, Hemkund, Pindari Glacier and hill resorts of rare charm, like Nainital and Mussoorie attract ever-increasing number of tourists. Places like Sravasti, Sarnath, Kushinagar, Sankisa and Kaushambi attract pilgrims both from within and outside the country. Besides ancient places of pilgrimage like Varanasi, Naimisharanya, Prayag, Badrinath, Kedarnath, Gangotri, Hardwar are also situated in this State. Places like Agra, Ayodhya, Sarnath, Varanasi, Lucknow, Mathura and Prayag have rich treasures of Hindu and Islamic architecture.

The Tourist Department provides facilities for boarding & lodging of tourists. At present there are 52 accommodation units in the State and the number of beds available in them is 2103.

Tourist Offices at Delhi, Calcutta and Ahmedabad have been equipped with Telex facilities. Three new Regional Tourist Offices have been opened at Madras, Bombay & Chandigarh and new reception centres have started functioning at the Railway Stations at Hardwar, Varanasi and Gorakhpur. Telex has also been installed in the Tourist Bungalows of Varanasi and Agra and at the Head Office at Lucknow to provide information speedily to the tourists. The Tourism Development Corporation of the State has three air-conditioned cars, converted into taxis, at Agra and with all-India permits, for the use of tourists.

179. WEST BENGAL

West Bengal covers the bottleneck of India in the east, stretching from the Himalayas in the north to the Bay of Bengal in the south. It is bounded on the north by Sikkim and Bhutan, on the east by Assam and Bangladesh, on the south by the Bay of Bengal and on the west by Orissa, Bihar and Nepal.

Physiography. West Bengal has two natural divisions, the Himalayan north comprising the districts of Darjeeling, Jalpaiguri and Cooch Behar and the alluvial plain that lies south of it. Darjeeling, the northernmost district has a maximum elevation of 3658 m above the sea level. The Jalpaiguri and Cooch Behar districts are low-lying areas watered by swift-flowing rivers like the Tista, the Torsa, the Jaldhaka and the Ranjit. The southern part is a thickly populated level expanse of rice fields, dotted with mango, coconut and banana gardens. This vast alluvial plain is the handiwork of many big rivers, the chief of which are the Bhagirathi and its tributaries—the Mayurakshi, the Damodar, the Kangsabati, and the Rupnarayan. The Bhagirathi, called Hooghly in its lower reaches, is itself a branch of the Ganga and provides Calcutta its link with the sea.

The entire State belongs to the high rainfall region. Rainfall varies from 120 cm in the south western region to 400 cm in the northern region. The normal rainfall for the State as a whole is around 175 cm.

History. The old Bengal (of which W. Bengal forms a part) known as Gauda or Vanga in ancient Sanskrit literature appears to have been celebrated from the epic period. The Mahabharata refers to the King of Vanga as an ally of the Kauravas in their war against the Pandavas. Apparently at the time of Aryan penetration into the east, Vanga had a well-settled civilization and culture.

In the 3rd century B.C. Bengal was part of the Mauryan Empire and from the 4th to the 6th centuries A. D., it was under the Gupta dynasty. By about A.D. 800, Bengal had its own dynasty of independent kings, the Palas. The Palas were very powerful and expanded their territories into the neighbouring countries of Bihar, Orissa and Assam. At the height of their power they had diplomatic relations with the Indonesian king Sri Vijaya. In the 11th century, Bengal passed under the rule of a new dynasty, the Senas. The Senas who ruled from their capital at Nadia were driven out by Qutbud Din, the Sultan of Delhi. Thereafter, Bengal became a part of the Delhi Empire. With the death of Aurangzeb, the last of the great Mughals, Bengal became independent under its Muslim governors. Siraj Daula, the last independent Muslim ruler of Bengal, was defeated by the British at the battle of Plassey in 1757. For about seven years the British were in a sort of dual control with the successors of Sirajud Daula, Mir Jaffar and Mir Kasim. In 1764 Mir Kasim was routed at the battle of Buxar and the British took over the administration of Bengal.

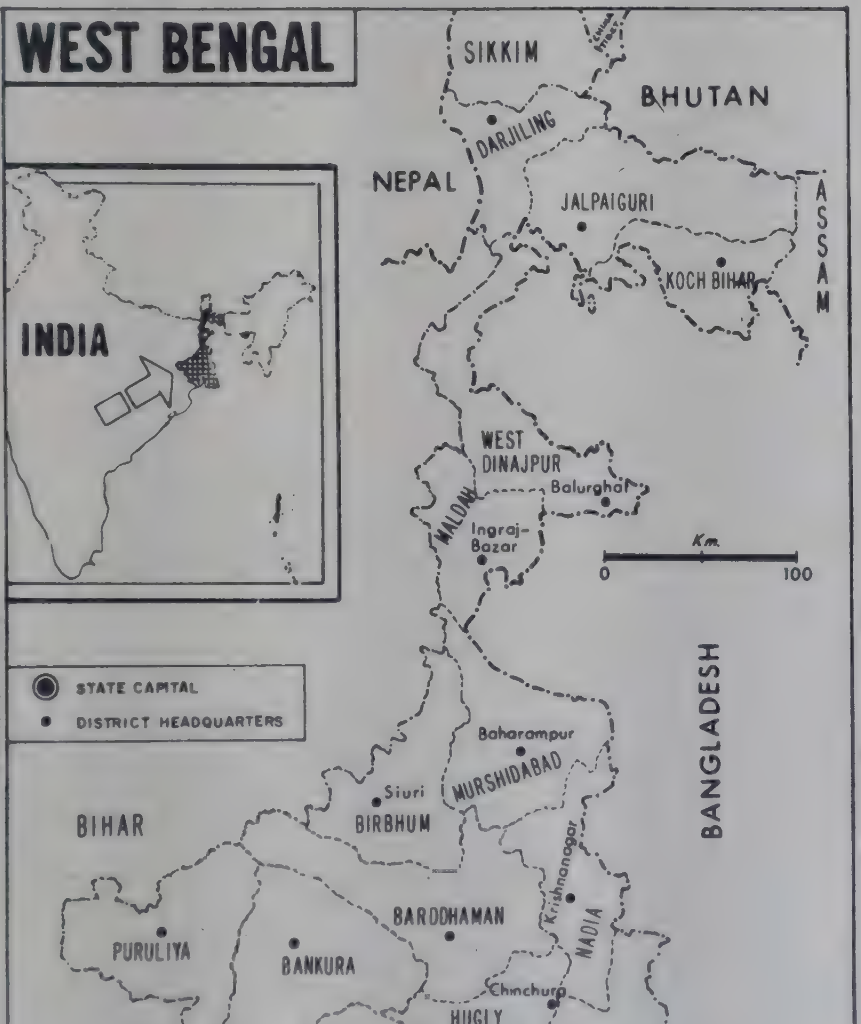
When Bengal was first constituted by the British as a province it was a vast area, including present-day Bihar and Orissa and extended westwards upto Agra. In 1863 Agra was detached from Bengal but Assam was added to it. In 1874 Assam was formed into a separate province.

In 1905 Lord Curzon divided Bengal into two provinces. A new province called Assam and East Bengal with its capital at Dacca were carved out of old Bengal. The rest of the territory together with Bihar and part of Orissa formed Bengal. This event, known as the partition of Bengal, aroused the dormant patriotism of the Bengalis, who opposed the partition as an attempt at disintegrating Bengal. The rest of India stood by Bengal and troubles broke out.

Peace was restored in 1911, when the partition was abrogated by a declaration of King George V at the Royal Durbar in Delhi. Another change announced at the Durbar was the shifting of the capital from Calcutta to Delhi. The new Bengal did not include Assam or Bihar. It was a compact area of over 200,500 sq. km.

When India became independent in 1947, Bengal was partitioned between India and Pakistan. While Pakistan's share came to be called East Pakistan, India's share was called West Bengal. In 1950 the Princely State of Cooch Behar was merged into West Bengal. The former French enclave of Chandranagore was added on Oct. 2, 1954. Under the States' Reorganisation Act, some parts of Bihar were transferred to Bengal.

Famines and Riots. During the five years preceding freedom, Bengal was visited by two calamities. The first was the Bengal famine of 1943 which was caused by the Government's policy of war procurement and denial of transport for other purposes. The famine resulted in the death of about 3 million people. The second was the great Calcutta killing as a result of the communal riots engineered by the Muslim League government in Bengal in August 1946. The Calcutta killings sparked off another wave of massacre of Hindus in the Naokhali district of East Bengal. While the rest of Bengal was quiet there were retaliatory killings of Muslims in Bihar. Shocked by this frenzy of killings, Gandhiji spent more than nine months in Naokhali and Calcutta to pacify



The territorial waters of India [illegible] into the sea to a distance of twelve nautical miles measured [illegible] the appropriate base line

Based upon Survey [illegible] the permission of the Surveyor General of India communal passions. But it hardly relieved the gruesome memories of this communal bloodshed.

The 1947 partition of Bengal between India and Pakistan shattered the closely integrated economy of East and West Bengal. An exodus of Hindus into West Bengal for refuge began in waves and up to 1971 over 4.7 million people had sought the aid of the Government of India for rehabilitation. A considerable number of other people rehabilitated themselves, so to speak, without any governmental aid. Hardly had the refugees started settling down, when another 10 million people—both Hindus and Muslims—surged into W. Bengal. This was the result of the reign of terror let loose by the Pakistan army on the 25th March 1971 on East Pakistan for its reported independent stance. The Indian army in collaboration with the Mukti Bahini took matters in hand. It started a counter offensive before which the Pakistan army crumbled. They surrendered to the Indian commander and Bangladesh was formed. With the surrender of the Pakistan army, many of the refugees returned to Bangladesh but it took some time before West Bengal could recover from the shock of the refugee influx.

Administration. The legislature is unicameral—the Legislative Assembly. The State is divided into 16 districts.

Table 228

Population of West Bengal

(1981 Census Provisional)

District	*Area in (Sq. km)*	*Population*	*Head-quarters*
Bankura	6881	2374205	Bankura
Birbhum	4550	2094756	Suri
Burdwan	7028	4808886	Burdwan
Calcutta	104	3291655	Calcutta
Cooch Behar	3386	1771562	Cooch Behar
Darjeeling	3075	1006434	Darjeeling
Hooghly	3145	3549817	Chinsurah
Howrah	1474	2957464	Howrah
Jalpaiguri	6245	2207087	Jalpaiguri
Malda	3713	2035009	English Bazar
Midnapore	14081	6723860	Midnapore
Murshidabad	5341	3702869	Berhampore
Nadia	3927	2977013	Krishnagore
Purulia	6259	1855429	Purulia
24-Parganas	14136	10726751	Alipore
W. Dinajpore	5206	2402763	Balurghat

Source: Census of India, 1981 Paper I, Series 23, West Bengal.

Panchayats. The panchayat system is three-tiered with 3242 Gram Panchayats at the base, 324 Panchayat Samities at the block (intermediate) level and 15 Zilla (district) Parishads. The Panchayat system has been brought into existence by the first ever Panchayat elections held in June 1978. The Panchayat institutions are the main agencies which implement development programmes.

Agriculture. By far the most important crop of West Bengal is rice. It occupies nearly 71 per cent of the total cultivated area of the State. The State accounts for about 7 per cent of the country's total foodgrains production (1970-71) and ranks fourth among the States in this respect.

Index number of Agricultural Area, Production and Productivity of Rice Crops of West Bengal.

(Base: Triennium ending crop year 1971-72=100)

Crop	*Period*	*Area*	*Production*	*Productivity*
Rice	1974-75	108.61	104.91	96.59
	1975-76	108.76	110.14	101.28
	1976-77	104.30	95.45	91.51
	1977-78	108.51	120.43	110.99
	1978-79	95.50	107.10	112.15
	1979-80	98.29	94.51	96.15
	1980-81	103.74	119.91	115.59

Source: Bureau of Applied Economics & Statistics, West Bengal.

Among cash crops, jute, mesta and tea dominate. West Bengal produces nearly 50 per cent of India's jute, 25 per cent of mesta and 50 per cent of tea. Cotton is coming up as an important cash crop.

Oil-seeds occupy only two per cent of the cultivated area of the State. They meet only a fraction of the need of the State. West Bengal is a big consumer of mustard oil which is a 'must' in Bengali cooking. It is also used for rubbing on the skin. But much of this commodity has to be imported from nearby States.

(1) Area and Production of some crops in West Bengal for the year 1980-81.

Table 227

Items	*Area in thousand hectares*	*Production in thousand tonnes*
Rice	5176.2	7465.6
Total foodgrains	6099.3	8282.0
Jute*	610.4	4442.7
Mesta*	44.4	259.4
Tea†	—	133172§
Cotton	0.2	0.4

Rapeseed & Mustard	131.1	79.2
Total Oil seeds	317.4	150.4

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* Production of Jute & Mesta in thousand bales of 180 kg each.

† Production of tea in thousand kg.

§ Provisional

Source: Directorate of Agriculture, West Bengal.

Land Reforms. With a view to ensuring the rights of share-croppers in the land and settling disputes regarding their rights, the left-front government adopted a cut and dried policy called 'Operation Barga'. The processes contemplated by this operation will have settled once and for all, all disputes regarding sharecroppers and their rights.

Area of vested agricultural land available for distribution and number of beneficiaries in West Bengal.

Table 228

(As on 30th June, 1981)

Area of land free for distribution (in hectare)	*Area of land distributed (in hectare)*	*Total number of beneficiaries*
424,179.07	283,912.57	1,284,856

Number of Bargadars recorded in the year 1981 is 1,089,500.

Irrigation. W. Bengal is an area of high rainfall. Therefore, irrigation by itself is not a matter of great importance. But in view of the low land-man ratio, it is necessary to have a compensating increase in irrigation facilities so that the gross area under irrigation can be sufficiently increased through multiple cropping or other such intensive methods.

Area irrigated by Govt. canals in W. Bengal for the year 1977-78 to 1979-80.

Table 229

Hectares

1977-78	*1978-79*	*1979-80*
962,646	1,064,161	851,582

Source: Assistant Engineer, Irrigation & Waterways Directorate.

Forest. During 1980-81 the State government earned a revenue of Rs. 1235.35 lakhs against an expenditure of Rs. 1469.00 lakhs thus incurring a net loss.

Animal Husbandry. The livestock population of the State is very large, accounting for about 5.6 per cent of the total livestock in the country.

Table 230

Growth of livestock

In thousand number

Items	*1972*	*1976**
Cattle	11878	11968
Buffaloes	824	758
Others	6383	7125
Poultry	15492	15052

Source: (1) Livestock Census Report, West Bengal

(2) State Sample of 3071 Rural of NSS

* Estimated

Fisheries. Fish is a very important item in the food of Bengalis. The State is a leading producer of fresh water fish in India. There is a considerable amount of fish catch from the estuarine waters and the Sunderbans. Coastal fisheries give a further supply. Deep sea fishing is also being developed. Yet the consumption in the State is much higher than the supply.

Fish culture is well developed in the State. In the rural areas there are many private fish ponds. Fry are sold in the markets and people purchase them to raise them in their ponds. Large ponds and tanks are auctioned to professional fishermen. The best known of these are the Bheries of Sunderbans in the 24-Parganas district. The estimated value of the State's fishery products is Rs. 73.78 cr.

Minerals. W. Bengal is the second largest mineral producing State after Bihar and accounts for about one-fifth of the total value of mineral output in India. Coal is the principal mineral, contributing 99 per cent of the State's total mineral output and about 30 per cent of the total coal production in India. Fireclay is another important mineral in the production of which Bengal ranks third, after Bihar and MP. China-clay and dolomites are found in abundance. Quartz is found in Raghunathpur and wolfram at Jhilmili & Poraphar. Manganese ores occur in Midnapore and arsenic in small quantities in Darjeeling.

The mineral production in the State since 1973 is not considered satisfactory though coal has acquitted itself creditably.

Table 231

Progress of Mineral Production

Mineral	*1978*	*1979*	*1980*
Coal†	21460	19200	19230
China clay*	73939	101540‡	76238
Dolomite*	31093	37980‡	32363
Fireclay*	9818	18571‡	9212

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† '000 tonnes * tonnes ‡ Revised

Source: Economic Review 1981-82.

Power. Coal has been the chief power producer of the State. In fact while there is much thermal production, there is very little hydel power development.

In 1976-77 the major power consumer in the State was the industrial sector with 66 per cent while domestic use accounted for 11 per cent and traction 7 per cent, the rest being used up for miscellaneous purposes.

Scheduled additions to installed capacity from 1978-79 to 1983-84 in 15 power stations is 1781 MW. Farakka Super Thermal Project with a generating capacity of 1100 MW has been taken up by the Central government and will begin supply by 1984.

Table 232
Power Supply Position

MW

	1978-79	*1979-80*	*1980-81*	*1981-82*
Installed Capacity (Derated)	1732.6	1825.3	..	..
Availability (excluding D.V.C.)	868.0	914.0	948.0*	1074.0
Potential Peak Demand	1082.0	1212.0	1290.0	1467.0

Source: Economic Review.

* At 60 per cent.

Industry. West Bengal has been in the forefront of industrial development from the very beginning. Two leading industries of the State, jute and tea, had a very early lead and today are two important foreign exchange earners of India. West Bengal was also the first State to start paper and steel industries. The discovery of coal in Raniganj was the starting point of the industrial revolution in India.

In the present industrial structure of the State, the engineering industry is shared between public and private sector companies. Chemicals and rubber form other important branches of industry.

A number of central public sector undertakings including locomotive, cable, fertilizer, ship-building and ordnance are also located in West Bengal. New industrial areas are being developed at Asansol, Durgapur, Farakka, Haldia, Kalyani, Kharagpur, Santaldih and Siliguri. The Fertilizer Corporation of India is setting up a fertilizer project at Haldia, where a new port and an oil refinery are also under construction. New industrial ventures include cement, scooter, electricals and mini-steel plants.

The index of industrial production (base 1970) showed a fall from 107.4 in 1977 to 102.5 in 1978. The major reason of this fall was the devastating flood of 1978 besides power shortage.

In 1978-79 the index of raw jute production in the State increased significantly, attaining the figure 129.5 against 108.3 in the previous year but the production of jute goods increased very marginally.

The production of tea in the State increased from 131.3 million kg in 1977 to 135.6 million kg in 1978.

Table 233
Index Number of Industrial Production (Base: 1970=100)

1977	*1978*	*1979*	*1980*
121.9	117.2	114.8	117.4

Note: Figures are provisional.

Source: Bureau of Applied Economics and Statistics, West Bengal.

Table 234
Production of selected industries

Industries & Items	*Unit*	*1977*	*1978*	*1979*	*1980*
1. Textile Industries—					
a) Jute—					
i) Hessian	'000 tonnes	346	339	309	382
ii) Sacking	-do-	433	460	459	572
iii) Others	-do-	249	243	221	216
Total	'000 tonnes	1028	1042	989	1170
b) Cotton—					
i) Yarn	'000 Kg.	33847	38697	37561	48239
ii) Cloth	'000 mtr.	113773	105027	127822	138602
2. Steel—					
i) Semi-finished steel	'000 tonnes	552	443	397	424
ii) Finished Steel	-do-	1129	1079	832	784

Source: Economic Review, 1981 82.

Table 235
Employment in registered working factories

(excluding Defence Factories)

	1977	1978	1979	1980
Registered factories				
(a) Working factories (Number)	5837	5967	6144	6421
(b) Average daily employment (Number in thousand)	826	839	857	875

Source: Economic Review, 1981-82.

Table 236
Industrial disputes

(Number)

	1977	1978	1979	1980
Strikes	206	172	146	78
Lock-outs	191	199	144	135
Total	397	371	290	213

Source: Economic Review, 1981-82.

The production of coal in the State showed a fall from 23.8 million tonnes in 1977 to 21.5 million tonnes in 1978. The production of semi-finished steel and finished steel fell from 5.5 lakh tonnes and 11.3 lakh tonnes in 1977 to 4.4 lakh tonnes and 10.2 lakh tonnes respectively in 1978.

The production of cotton yarn at the State level registered an increase from 338.5 lakh kg to 349.4 lakh kg while that of cotton cloth showed a fall from 1137.7 lakh metres to 1038.5 lakh metres. The Economic Review 1979-80 stated that the non-uniform increase and non-equalisation of the freight rates in respect of cotton textile had been the major constraining factors.

Employment. In rural sector, employment position improved in 1978-79, according to the Economic Review, due to massive production drive in the rabi season of 1978-79, special programmes on Rural Works, Food for Work and other development work as post-flood restoration measures. The total no. of man-days generated from these programmes was 566.3 lakhs in 1978-79. The present Government introduced the minimum wage of Rs. 8.33 per day for agricultural workers.

In the industrial sector, there has been an increase in the average daily employment in the registered working factories from 826 thousand in 1977 to 839 thousand in 1978. The number of registered working factories showed a rise from 5837 in 1977 to 5969 in 1978. This increase is attributed to the steps taken by the Govt. of West Bengal to revive the sick and the closed units. There was a fall in the number of strikes in 1978 and in 1979 and a fall of lock-outs in 1979.

The number of vacancies notified in Employment Exchanges in respect of public and private organisations was 34885 as against 11983 of the placement effected in the same year of 1979. Unemployment assistance at the rate of Rs. 600/- per annum was paid by 1979-80 to 211,485 unemployed youths registered at Employment exchanges for more than 5 years.

Table 237
Employment

(Number)

	1977	1978	1979	1980
1. Vacancies notified during the year	40727	46072	44551	37449
2. Placed in employment	18123	15518	15591	13831
		1978-79	1979-80	1980-81
Unemployment assistance recipients	—	144274	67207	61518

Source:- Economic Review, 1981—82.

Literacy & Education. West Bengal had a literacy percentage of 40.88 (1981) which is above the national average of 36.17. Its school attendance, however, is far less commendable. In 1974-75 W. Bengal showed 151 pupils (per thousand population) attending schools. This was above the national average but far below that of some other States, which are less developed, like Manipur (262.3) and Meghalaya (235.6).

Table 238
Number of Schools

Year	*Primary and Junior Basic*	*Junior High*	*High and Higher Secondary*
1975—76	40740	3145	4556
1976—77	40941	3963	4595
1977—78	42881	3207	4877
1978—79	43849	3174	4878†
1979—80‡	45645	3178	4995
1980—81‡	46248	3157	5067

† Revised ‡ Provisional

Note: Revised on the basis of latest available information

Source: Economic Review, 1981—82.

In higher education the State is well equipped. There are 8 Universities, 5 Engineering colleges and 7 Medical colleges.

Table 239

Number of Hospitals, Health Centres, Clinics, Dispensaries and Beds

Year	*Medical Institutions (Total)*	*Beds (Total)*
1975	2330	46938
1976	2334	52624
1977	2358	53553
1978	2376	53918
1979	2394	55477

Source: State Bureau of Health Intelligence, West Bengal.

Tourism

Calcutta was until 1912 the capital of the Government of India. It is now the commercial capital of India. It is also the centre of the great industries—jute, tea, hides and skins, coal and lac. Places of interest are: Victoria Memorial (Picture gallery and museum), Indian Museum, Zoological Gardens, the Jain Temple, the Kalighat Temple, Belvedere House (originally the residence of British Viceroys when they visited Calcutta and now made the National Library), Raj Bhavan (residence of the Governor of W. Bengal), Marble Palace, Fort William, Eden Gardens, Dalhousie Square and Dakshineswar Temple.

Darjeeling is on the Himalayan slope and is one of the famous hill stations of India. It is 370 miles north of Calcutta. Places of interest are: Government house, Town Hall, Museum, Observatory Hill, Botanical Gardens, Birch Hill Park, Senchal Lakes, Ghoom Monastery and Tiger Hill.

Santiniketan in West Bengal, 91 miles from Calcutta, is the home of the famous Visva Bharati University founded by Rabindranath Tagore.

62

National Income

During 1980-81 national income registered a substantial increase of 7.7 per cent in real terms, as against the estimated 7 per cent.

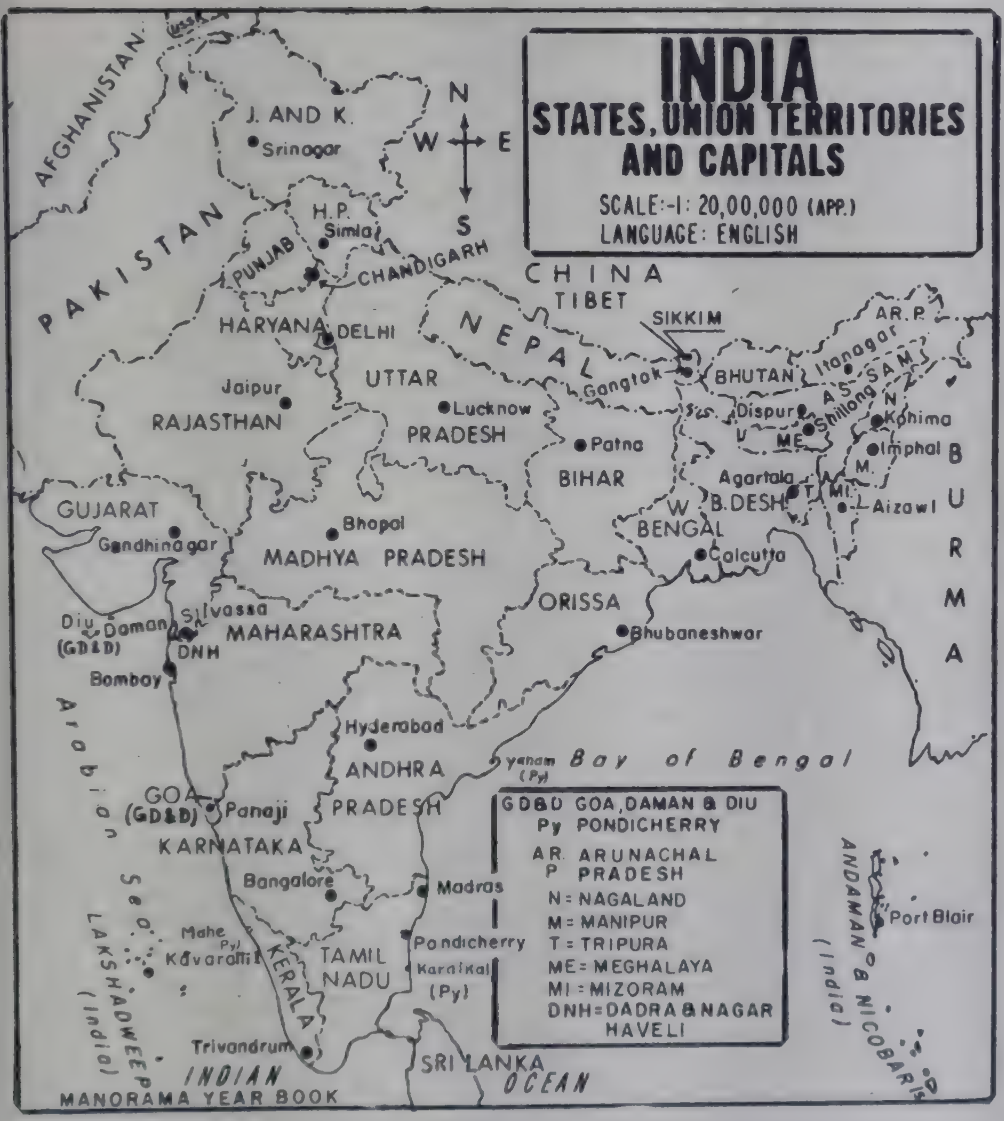
This was revealed in the "quick estimates" of national income and related aggregates for the financial year 1980-81, released by the Central Statistical Organisation of the Planning Commission.

At current prices, the national income stands at Rs. 104,201 crores in 1980-81 as compared to Rs. 87,253 crores in 1979-80, thus recording an increase of 19.4 per cent. This high rate of growth of 19.4 per cent in national income at current prices, as against 7.7 per cent in real terms is due to price rise of about 11 per cent during the year 1980-81.

The remaining increase in national income has been neutralised by the increase in population.

Per capita income was estimated to have registered an increase by 5.3 per cent in real terms, from Rs. 661 in 1979-80 to Rs. 696 in 1980-81.

—The Indian Express, New Delhi.



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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

II UNION TERRITORIES

Table 240

1981 Census

Territory	*Population*	*Density (per sq. km)*	*Sex Ratio***	*Literacy (percentage)*
Andaman & Nicobar Islands	188,254 (29)*	23 (28)*	761 (31)*	51.27 (8)*
Arunachal Pradesh	628,050 (24)	7 (30)	870 (26)	20.09 (29)‡
Chandigarh	450,061 (27)	3948 (2)	770 (30)	64.68 (2)
Dadra & Nagar Haveli	103,677 (30)	211 (14)	974 (9)	26.60 (26)
Delhi	6,196,414 (16)	4178 (1)	810 (29)	61.06 (3)
Goa, Daman & Diu	1,082,117 (22)	284 (12)	981 (5)	55.86 (5)
Lakshadweep	40,237 (31)	1257 (3)	976 (7)	54.72 (6)
Mizoram	487,774 (26)	23 (29)	936 (19)	59.50 (4)
Pondicherry	604,136 (25)	1228 (4)	985 (3)	54.23 (7)
All India	683,810,051	221	935	36.17

** *Sex Ratio* is the number of women per 1000 men. Only Kerala among States & Union Territories has 1034 women/1000 men. All others have below 1000 women/1000 men.

* Brackets indicate ranking among States & Territories.

‡ 29th is the last rank, because figures for Assam and J & K are not included.

180. ANDAMAN & NICOBAR ISLANDS

Andaman and Nicobar Islands are a group of more than 550 islands,* the great majority of which (about 500) are uninhabited being too small and with little or no water. This group of islands in the Bay of Bengal may be considered the counterpart of the Lakshadweep Islands in the Arabian sea — both of them being the overseas possessions of the Indian Union.

Physiography. Andaman and Nicobar Islands are continental islands lying between 6 and 14 degree north latitude and 92 and 94 degree east longitude. They form two broad groups — Andamans & Nicobars which are separated by the 10 degree channel which is about 145 km wide and 400 fathoms deep. Geologically the islands appear to have been part of the land mass of south east Asia comprising north east India, Burma, Thailand, Malaysia and Indonesia. It is thought that Andamans and Nicobars are the remnants of two vast mountain ranges which, at one time, stretched from Arrakkan in Burma (Cape Negrias) to Sumatra (Achin Head) in Indonesia, the 10 degree channel separating the two mountain systems. Geological movements led to the submergence of parts of these mountain systems leaving only the upper altitudes and higher peaks standing. These now form the land structure of Andamans and Nicobars.

Recent botanical investigations have supported the geological conclusions. They have established that while the flora of Andamans and Nicobars are strikingly dissimilar, the Andaman flora bears great affinity to the flora of northeast India and Burma, and Nicobar flora is closely allied to the flora of Malaysia and Indonesia. Geographical proximities also indicate the common geological origin of north-east India, Burma, Malaysia and Indonesia. Port Blair, the headquarters of the Islands, is 1255 km from Calcutta (by sea), 1191 km from Madras and 580 km from Rangoon.

The Andaman Group has, at the extreme north, Land Fall Island which is about 900 km away from the mouth of the Hooghly river and about 190 km from Burma. This island is followed by the three main islands, North Andaman, Middle Andaman and South Andaman — all of them separated from each other by shallow seas. This area is known as Great Andaman. Further south, at a distance of about 100 km from Port Blair, lies Little Andaman Island. Besides these, there is a large number of other islands in the group, many of them very small in size.

The Nicobar Group lying south of the Andamans extends from 6° to 10° north latitude. The northernmost island is Car Nicobar which lies about 120 km to the south of Little Andaman and the southernmost island is Great Nicobar barely about

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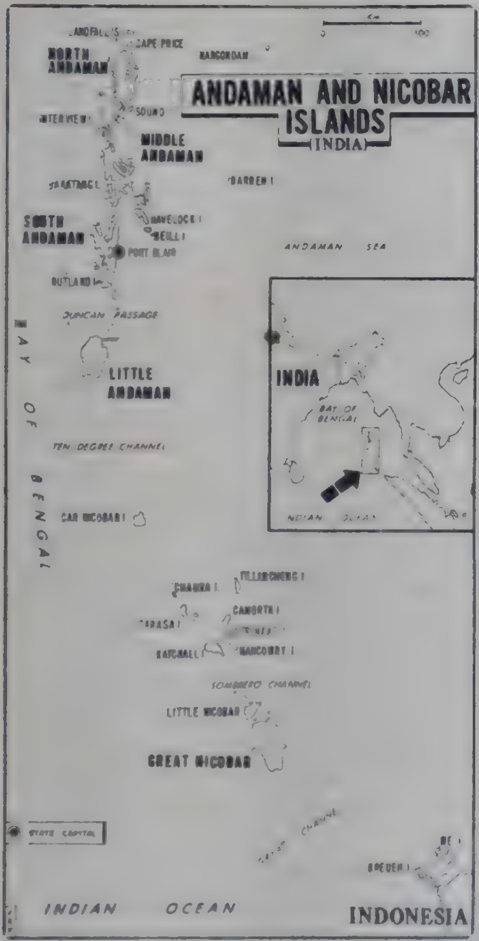
* *Source:* Andaman and Nicobar Information, 1979.

150 km from Sumatra. The important islands in this group are Great Nicobar, Car Nicobar, Chowra, Teressa, Nancowrie, Katchal and Little Nicobar.

The total area of the two groups of islands is 8293 sq. km of which Andamans with 6340 sq. km account for more than 76 percent of the land area. The Andaman Group stretches over 464 km in length and has a maximum width of 51 km, the average width being only 24 km in the Andaman group, the biggest island in terms of area is Middle Andaman covering about 1536 sq. km.



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The total area of the Nicobar group of islands is 1953 sq. km, the length and width being about 260 km and 58 km respectively. In this group, the Great Nicobar has the largest area of about 1045 sq. km.

Climate & Rainfall. The climate of Andaman & Nicobar Islands is of the tropical type but the continuous breezes blowing in from the surrounding seas make it most pleasant. The islands have very little annual variation of temperature, the variation being 3° to 5° F for mean minimum temperature and 4° to 7° F for mean maximum temperature. Extremes of summer and winter are practically unknown. The period between December and February constitutes the cold season. March to May is the hot season and April is the hottest month.

These islands lie within the full sweep of both the monsoons, but the heavy annual rainfall of about 125 inches is mostly derived from the south-west monsoon. May to June and September to October are usually the two periods of maximum rainfall. Rainfall is heaviest in June. The north-east monsoon winds start in November and blow till the end of January. March and April are the driest months. The rains last longer in the south, so that some of the islands of the Nicobar group have rain throughout the year.

Himidity is high throughout the year, but no worse than in Bombay or Calcutta during the monsoons.

History. The Andaman & Nicobar Islands, also known as the Bay Islands, had little historical importance till the advent of the European powers into India and the East in the 16th century. The Portuguese who came first were not particularly interested in these islands but they were interested in the East Indies. The Dutch who came next drove the Portuguese from the East Indies and the Bay Islands naturally came into their domain. Meanwhile, the British who had established themselves in India came into conflict with the Dutch in and around the Andamans. It did not take long for the British to drive out the Dutch and occupy the islands.

The British in India were at first interested in these islands as a penal settlement for Indian convicts just as the British at home pitched upon Australia as a convict camp in the first instance, but in a different way and for different reasons. The idea of a penal settlement in the Andamans was first suggested by the necessity to provide succour to the crews wrecked in the turbulent Andaman

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Note: The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

waters and to save them from the attacks of the aboriginals. In fact the penal settlement was to be so constituted that it might become the nucleus of a colony or that a colony might grow up side by side with it. Attempts at colonisation were ultimately given up but the penal settlement survived. The occasion came with the Revolt of 1857.

This Revolt called the Sepoy Mutiny by British historians was a traumatic landmark in the history of the British Raj in India. Having put down the revolt, the British found that they had on their hands a large number of rebel convicts whom the Indian prisons of those days would hardly contain. The Andamans offered a ready-made solution. It is estimated that

Box 63

The Vanishing Tribes

The tribals of Andamans are fast dying out. Their numbers have been dwindling ominously since the '30s. Anthropologists think that it is the contact with mainlanders that reduces the tribal population and that if we must save them they must be left undisturbed wherever they are found.

All surviving tribes are Negritos. A 1977 estimate places their numbers as under: Great Andamanese (so named after the place where they were found—Great Andamans)-123, Jarwas-250, Sentinelese-100, and Onges-104.

The administration has settled the Great Andamanese in the Strait island, a small area off the eastern coast of Middle Andamans. The Jarwas inhabit a reserved forest of about 648 sq. km on the western coast of South and Middle Andaman.

The Sentinelese are the sole inhabitants of the North Sentinel Island with an area of about 47 sq. km south-west of Port Blair.

The Onges live in Little Andamans with an area of 751 sq. km. Until recently it was the exclusive home of the Onges, but now it has been opened up for settlement by mainlanders.

The Jarwas and the Sentinelese live in "active isolation" and are hostile to outsiders. They have reasons for being so. The Jarwas had been used to seeing the Great Andamanese all round them all over South, Middle and North Andaman forests. But, gradually they had become more and more scarce after their close association with the settlers. The Jarwas, obviously, do not want to meet the fate of the Great Andamanese and have decided to keep their distance from the strangers.

Some contact has, however, been established with a section of the Jarwas and gifts are occasionally sent to them. The administration has also abandoned some of the actions, like sending punitive expeditions or establishing bush police outposts. Jarwa "incidents" do occur, but raiding of nearby settlements to pick up iron tools (for making arrows) and eatables is becoming few and far between.

But the Sentinelese have maintained total isolation. An attempt was made a few years back to land on the shore of their island but it proved in vain. Armed with arrows the Sentinelese atacked the party and hit a couple of them. The Sentinelese are probably the world's only palaeolithic (old stone age) people surviving today without any contact with any other group of humanity.

The problem the tribes are facing is one of survival. The population of all the tribes has been declining in spite of governmental measures to preserve them. The decline is faster in case of those who have come into contact with settlers.

Source: Indian Express, 1977

between 1858 and 1860 some 2000—4000 sepoy mutineers were sent to the Andamans. Almost all of them died under agonising circumstances.

With the British occupation of the islands, contacts with the mainland of India grew. Many Indian traders, especially from the west coast of India, established themselves as traders in the islands. But the most outstanding feature of British occupation was the spread of Christianity in the islands.

The Cellular Jail. Meanwhile, a radical change occurred in the penal system in the Andamans. At first, the prisoners were confined in barracks for the night. This system was replaced by the Cellular Jail. Here, each prisoner was confined to a cell at night. The construction of the Cellular Jail was taken up in 1892. The construction itself was carried out by convicts. By 1897 four hundred cells were built. In 1910, all the 7 wings of the jail containing 663 cells were completed.

The prisoners, who were deported to the Andamans, were all political prisoners of one sort or another. All these were arraigned for the offence of 'waging war against the king' for which the minimum punishment was transportation for life — which meant the Andamans. As the national movement spread, streams of prisoners continued to flow into the Andamans without end. The first batch that followed the sepoy mutineers were the Wahabis, a Muslim revolutionary movement. They were followed by the Manipuri patriots who rose against the British Raj.

By the beginning of the 20the century the freedom movement had spread out and more and more prisoners flowed into the Andamans. All these convicts were called 'terrorists' whether they made fiery speeches or wrote seditious articles or used the gun or the bomb with intent to kill. Most of these convicts were respected national leaders. But all were treated harshly and cruelly. Many prisoners resorted to hunger strike and died of starvation. Many others committed suicide. According to one account 3 prisoners committed suicide on an average every month.

With the Montford reforms of 1919 a general amnesty was extended to all prisoners in the Andamans and most of the prisoners in the Cellular Jail were released. This happy interlude did not last long. Fresh outbursts like the Moplah rebellion of Kerala (1921), the Rumpa peasants revolt in Andhra Pradesh (1922) and the Tharawady revolt in Burma (1930) sent waves and waves of prisoners again to the Andamans. The constitutional reforms of 1935 necesitated a thorough revision of policy. It became unavoidable when some 183 Andaman prisoners went on a hunger strike to be repatriated to their native provinces in India and the prisoners in India staged a sympathetic strike. As the climate worsened, the British government yielded. In Sept., 1937 the first batch of prisoners left the Andamans and by Jan., 1938 all prisoners were released.

The Second World war and the consequent Japanese occupation of these islands from 1942—1945 brought the islanders a taste of foreign military occupation. The Japanese inflicted extreme torture on the poor islands and destroyed their homes and coconut gardens. In the process, the entire face of the islands was changed in a few years. After the evacuation of the Japanese in 1945, the islands, as part of India, became free on August, 15, 1947.

One beneficial result of the Japanese occupation was the expulsion of the Indian traders, who had ruthlessly exploited the ignorant islanders. They had either fled from the islands or were killed during Japanese occupation. After independence, the Government of India was keen that mainland traders do not return to exploit the people and destroy their culture. The Andaman and Nicobar Islands (Protection of Aboriginal Tribes) Act was passed in 1956, under which entry into tribal areas was prohibited and no outsider could carry on trade or industry in the islands, without the licence of the Chief Commissioner. Since 1938 refugees and ex-service men were permitted and encouraged to settle down in the islands. Many of them have now become permanent settlers.

On November 1, 1956 the Andaman & Nicobar Islands were constituted into a Union Territory, administered by the President of India. The local administration is headed by a Chief Commissioner with his headquarters at Port Blair. In 1979 in response to a national demand Prime Minister Morarji Desai dedicated the Cellular Jail as a National Memorial. One of the survivors of the Cellular Jail, Bhai Paramanand, one-time professor, who was sentenced to death in the infamous Lahore Conspiracy case but whose sentence was commuted by the Viceroy to transportation to the Andamans, was the guest of honour when the Memorial was inaugurated on Feb. 11, 1979. At the time the Jail was dedicated, it had lost 4 of its original wings and only 3 have survived as a mute reminder of its tragic history.

Administration. The entire territory is delimited into 4 Sub-Divisions and 7 tehsils as follows:

Table 241

Area, Sub-Divisions and Tehsils

(in sq. km)

Sub-Division	*Tehsils included in the Sub-Division*	*Area*
1. Mayabunder	1. Diglipur	884
	2. Mayabunder	1348
	3. Rangat	1098
2. South Andaman	1. Port Blair 2. Ferrar Gunj	3010
3. Car Nicobar	1. Car Nicobar	129
4. Nancowrie	1. Nancowrie	1824

Population. The whole territory is divided into two districts with seven tehsils as under:

Table 242

Distribution of Population (1981 Census)

Name of Tehsil	*Area sq. km.*	*Population*	*Percentage to the total*
Diglipur	884.0	15619	8.3
Mayabunder	1347.8	13905	7.4
Rangat	1098.2	24238	12.9
Port Blair	3010.4	104059	55.3
Ferrar Gunj			
Car Nicobar	129.0	15481	8.2
Nancowrie	1823.6	14952	7.9
Total	8293.0	188254	100

Port Blair, the only town in the Territory, is part of Port Blair tehsil and has a population of 49632 in 1981 census.

The majority of the population are emigrants from the mainland. They have carried their religions and languages into the territory. Hindus constitute the majority of the population. Although emigrant populations use their mother tongues for communication among themselves, the language most widely spoken is Hindi.

Tribal Population. According to the 1981 Census the following tribes survived in the islands: Andamanese, Onges, Jarwas and Sentinelese in the Andamans and Nicobarese and Shompens in the Nicobars. These tribes belong to various ethnic groups. We know very little of their origins. However, it is thought that the Andamanese are related to the original inhabitants of India — the Negroids. The Negroids on the mainland have lost their language. It is presumed that the language that the Andamanese speak today is the old language that they brought into India.

Table 243

Tribal Population

Name of tribes	*1931*	*1941*	*1951*	*1961*	*1971*
In Andaman Islands					
Andamanese	93	—	23	19	24
Onges	(250)	—	(150)	129	112
Jarwas	(70)	—	(50)	(500)	+
Sentinelese	(50)	—	—	(50)	+
In Nicobar Islands					
Nicobarese	9589	12252	11902	13903	17874
Shompens	(200)	—	(20)	71	92

+ Not enumerated

Note: Figures in brackets are estimated figures.

Agriculture. The principal crops are rice, coconuts and arecanuts. The Nicobarese had taken to coconut and arecanut cultivation from times of yore. But the unscientific cultivation of these crops calls for radical improvements. Other crops are sugar-cane, pulses, fruit and vegetables. Recently it has been found that the climate is suitable for spices and rubber. Both are being tried out on the islands on a large scale.

Forests. Forests cover 7144 sq. km (1982). All types of forests are found in the islands — giant evergreens, hilltop evergreens, moist deciduous forests, littoral and sub-montane swamp forests. A large variety of timber is found in the Andamans. The most valuable woods are padauk and gurjan. These are not found in Nicobar. The forests of Nicobar are not therefore considered commercially attractive.

Forest is the main natural wealth of the islands. In 1981—82 forests brought in a revenue of Rs. 579.02 lakhs.

Animal Husbandry. Cattle dominate the livestock population, with pigs coming second and goats third. Poultry is also popular.

In 1979 there were 27401 cattle, 9719 buffaloes, 17598 goats and 21223 pigs. Total poultry numbered 183846.

Fisheries. The waters around the islands are rich in fish and surveys are being carried out to determine fishing potentialities. Unlike the mainland, there is no traditional fishing community in the islands. Therefore people interested in fishing and having some experience of it are being encouraged to settle down at vantage points like Little Andaman and Campbell Bay and to carry on organised fishing.

The total fish catch in 1981 amounted to 1905 tons valued at Rs. 85.90 lakhs.

Minerals. No mineral deposits of economic value have so far been found on the islands. However, some coal, chromite, gypsum and sulphur deposits have been identified but they do not occur in enough quantities for economic exploitation.

Transport. Considering the large number of islands and their distance from the mainland, the most important transport is shipping between the islands and the mainland and between the islands themselves. Air service is the next important transport linking Port Blair, the capital, with Calcutta and Madras. Roads come third in importance.

In 1980–81 the islands had 581 km of surfaced roads and 22 km of other roads.

Industry. Industries comprise saw milling, oil milling, plywood, and matches. A number of training-cum-production centres have been started by the Government. Saw-milling is the main industrial ability.

Power. The installed capacity in 1981–82 was 8608 kw with generation of 12635244 kwh. A total of 111 villages (out of 390) were electrified till 1980–81.

Literacy & Education. These islands have a literacy rate of 51.27 as per 1981 population census.

In 1981–82 the islands had 257 educational institutions (including 16 Senior Secondary Schools, 1 College and 1 Teachers' Training Institute) with a total enrolment of 45988 students.

Public Health. As on 31-3-1982 there were 13 Hospitals 67 Dispensaries and 2 Primary Health Centres with a total bed accommodation of 713. The Medical Personnel on the same date were 80 Doctors, 32 Nurses, 32 Midwives, 100 Compounders and others.

181. ARUNACHAL PRADESH

Arunachal Pradesh (Land of Sunrise) is a thinly populated hilly tract on the north east boundary of India. It is bordered by Bhutan on the west, Tibet and China on the north, Burma on the east and Assam on the south. Assam, in fact, thrusts itself like a wedge into Arunachal. It segregates a westward tending tail of Arunachal in the south. The southern tail however is not cut off. It circles the Dibrugarh district of Assam in the east and joins the major area in the north.

The Land and the People. Arunachal is entirely mountainous except for thin strips of flat land most of which adjoin Assam. Dense forests cover more than two-thirds of the territory. The population of Arunachal is predominantly tribal. All these tribes belong to the class of tribals described as Scheduled Tribes under the Constitution. According to the 1981 census, Scheduled Tribes formed 79 per cent of the population as against an average of 7 per cent for the whole of India. The census enumerated as many as 82 tribes.*

The principal tribes are: Monpa, Apatani, Nishi, Tagin, Galong, Sherdukpen, Adi Padam, Khampti, Singpho, Tangsha, Mishmi and Wancho. These tribes speak their own tongues. About fifty distinct tribal languages and dialects are spoken. Each tribe is divided into a number of exogenous clans.

Administration. Arunachal, originally known as the North East Frontier Agency (NEFA), was placed directly under the administration of the Union Government in 1948. It was declared a Union Territory under the name of Arunachal Pradesh on January 20, 1972. On 15th Aug. 1975, the Pradesh Council of Arunachal Pradesh was converted into a Legislative Assembly under the Constitution (Thirty-seventh Amendment) Act, 1975. A Council of Ministers was also constituted.

The Territory is administered by a Lt. Governor. As Arunachal had no well developed towns centrally located to house the headquarters, a new headquarters town was constructed at Itanagar. It was formally inaugurated in April 1974 as *New Itanagar.*

The Territory is divided into 9 districts each under a DeputyCommissioner. There are 32 Anchal Samities with Zilla Parishads for each district. These bodies function as advisory bodies only.

Table 244

Area, Population and Headquarters of Districts

District	*Head-quarters*	*Population* (1981)*	*Area (sq. km.)*
West Kameng	Bomdila	62946	
East Kameng	Seppa	42722	13724
Upper Subansiri	Daporijo	39406	
Lower Subansiri	Ziro	113300	14797
West Siang	Along	74151	
East Siang	Pasighat	70274	23723
Lohit	Tezu	69400	
Dibang Valley	Anini	27716	24427
Tirap	Khonsa	128135	6907
Total		628050	83578

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* Provisional

Agriculture. Nearly 46 per cent of the population of Arunachal Pradesh is engaged in agriculture. Irrigated area forms 17 per cent of the total cultivated area of about 14,000 hectares. The traditional method of agriculture is jhumming, a kind of shifting cultivation. The forests are cleared and crops are raised for one to three years, depending on the fertility of the soil. Thereafter the cultivators move on elsewhere. A determined effort is being made to wean the people from 'jhumming'. By 1979–80, 43,000 ha have been brought under permanent cultivation. The main crops are rice, maize, millets, wheat and mustard. Forests cover 61,000 sq. km of the area.

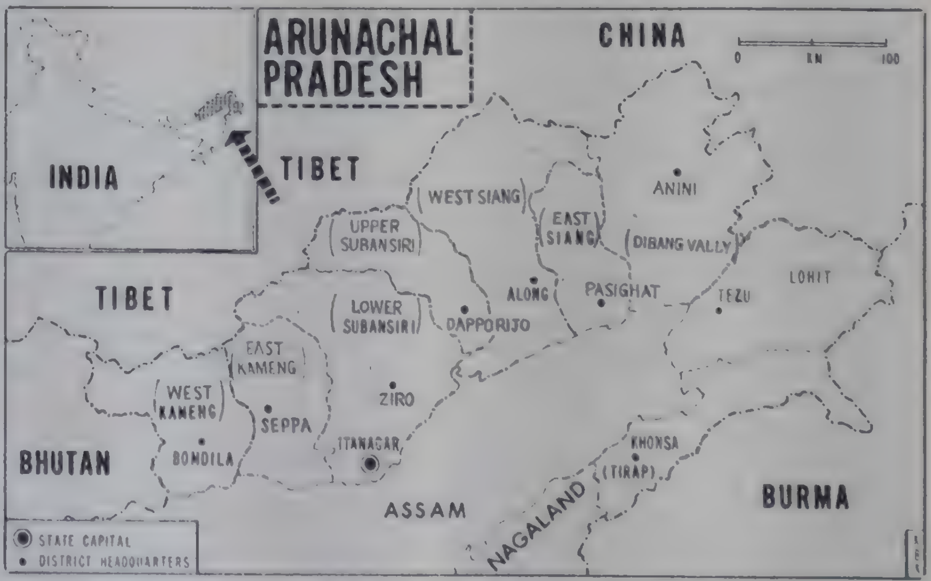
The forest department earned about Rs. 400 lakhs during 1980–81.

Industry. Principal industries are forest-based. Medium and small industries established, include sawmills, plywood and veneering mills, rice mills, fruit preservation units, oil expellers, besides handloom and handicrafts industries. A cement plant and other small scale industries are coming up.

Power. Arunachal's power resources are enormous. A number of projects designed to produce electricity by harnessing water-power has been finalised. The first project, with an installed capacity of 750 kw, was put into commission in August 1972 at Rahung in Kameng district. Total installed capacity is over 11,000 kw.

Literacy and Education. The Territory, unlike other territories, has a very poor percentage of literacy, the poorest in India (20.09 per cent 1981). But the Territory is showing good progress in education. Between 1975 and 1980 the number of primary schools increased from 184 to 874. There is now one Arts and Science College at Pasighat, 117 Middle Schools, 26 Secondary Schools, 10 Higher Secondary Schools, 2 Central Schools, one Evening College with about 65000 students on rolls.

Health. During the last decade development activities under the Health Programme made rapid strides and over the years the number of hospitals increased from 95 to 120. The bed strength today is 1270 comprising 816 general beds, 122 T.B. beds and 272 leprosy beds. In 1975 there were only 124 doctors, 131 nurses and 120 pharmacists. In 1980 there were 217 doctors, 180 nurses and 148 pharmacists. A referral hospital with 135 beds has been constructed at New Itanagar by the Ramakrishna Mission.



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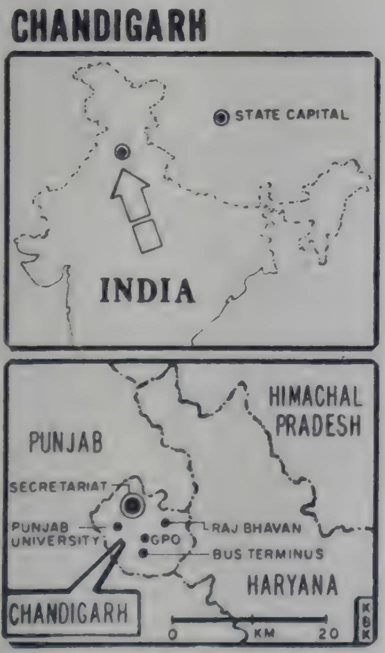
The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

182. CHANDIGARH

History. Chandigarh is a byproduct of the partition of India in 1947, when Punjab was divided between India and Pakistan. Pakistan got West Punjab and along with it the capital Lahore. India's share was East Punjab without any capital. For a time, Jullundur functioned as the capital of East Punjab. As Jullundur was too small for a capital, East Punjab started looking about for another site. It was felt that it would be cheaper and better to build a new capital than to convert any old town as a capital. After an aerial survey, the present site, which was more or less in the centre of the State, was chosen and the new capital was named Chandigarh after the temple of Chandi. The site has natural boundaries on three sides.



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The first plan for Chandigarh was prepared by an American architect Mathew Novoki. When Novoki died in an air crash in 1950 the famous French architect, Le Corbusier, was entrusted with the task. Modern Chandigarh is thus a Corbusier creation.

The basic planning unit of the city is the sector. Each sector is planned as a self-contained unit with all the facilities required by a number of families — shops, schools, hospitals, places of worship, recreational places, playgrounds and plenty of open space. Each sector is 246 acres in area. The initial plan provided for 47 sectors of this type. There is however no sector numbering 13.

At the time that Chandigarh was being built, it did not occur to any one that East Punjab faced a three-fold division. The Western part became the State of Haryana, the Eastern part continued as the State of Punjab while the hilly areas went to Himachal Pradesh. Chandigarh had now to function as the capital of two states — Punjab and Haryana. This raised a new problem about the administration of Chandigarh. The difficulty was solved by making Chandigarh and the neighbouring areas, a Union Territory under the administration of the Union Government.

Area and Population. Chandigarh is the smallest Union Territory being only 114 sq. km in area. Its urban area, including city proper and small town Manimajra,covers 57.6 sq. km while the rural area comprising 22-villages, is 56.4 sq. km. It ranks 26 among the States and Territories of India with a population of 450061 according to 1981 census, it includes urban and rural population. Urban population of Chandigarh city and Manimajra town comes to 90% of the total population. The rural population in the periphery comprises the rest 10% of the population.

Administration. Chandigarh is a city state like Delhi even though like Delhi, it is called a Union Territory. The Union Territory of Chandigarh is administered by a Chief Commissioner. It has one representative in the Lok-Sabha. The Chief Commissioner of Chandigarh has been vested with powers of a State Governor in respect of laws in force in the Union Territory of Chandigarh and with financial powers analogous to those exercised by the other administrators of Union Territories.

A Garden City. The Horticulture Division of the Administration has developed about 2000 acres of area in the city as Green Parks decorated with ornamental trees, shrubs and creepers etc. The parks are well maintained.

Both sides of the city roads have been planted with avenues of flowering and ornamental plants which make the entire city colourful in all seasons.

Leisure Valley. Leisure valley, which has an area of about 300 acres, passes through the centre of the city. Various types of gardens have been planned in this valley such as the Rose Garden, Shanti Kunj, Moonlight Garden, Garden of Bougainvilleas, Lilies, Cactii and Succulents and a garden of unusual plants. Out of these, the Rose Garden has already been completed. It has achieved a national reputation. The remaining gardens are being developed on the same lines.

Rose Garden. The Rose Garden covers an area of 30 acres and is located in the heart of the city. It is the biggest rose garden in Asia with a total population of about 50,000 rose plants and 1600 varieties of roses. A florist's shop has been constructed in the Rose Garden and soon cut flowers will be made available to the public in large quantities.

Chandigarh nurseries have done commendable work in the development of the beautiful landscapes in the city. It produces about 3.5 lakh saplings of ornamental trees, shrubs, creepers, roses and decorative plants annually as well as saplings of all kinds of fruit trees. The nurseries are being run on a no-profit and no-loss basis.

A green belt dividing the city from the industrial area has been planted with grafted mango plants in an area of about 60 acres. Rajendra Park with an area of about 200 acres has also been developed as a National Mango Garden. A garden of flowering-cum-fruit trees which contains fruit plants like pears, peaches, almonds, plums, chikoos, lemons, jamans etc. have also been planted in groves in various open spaces in the city.

Rock Garden. This is a unique garden of rocks, stones and scrap which has become a great tourist attraction. The garden is made up of countless assorted rocks and boulders of varied sizes and varying colours. Originally laid out by Nek Chand, it covers an area of six acres. Chandigarh Administration has taken over this garden and has opened it to the general public. Extension and improvement of the garden is being carried out under the supervision of the original architect Nek Chand himself.

Industries. Chandigarh is fast becoming an industrial centre. The establishment of H.M.T. at Pinjore and Punjab Tractors at Mohali has given added impetus for the development of ancillary small scale industries.

At present, there are 1258 small scale units and 14 large and medium scale units. Out of the large and medium scale units, two are in the public sector. Rest of the industries are in the private sector. The annual industrial output of Chandigarh is valued at about Rs. 65 crores. These industries provide employment to some 16000 workers.

Health. There is one General Hospital having 370 beds, one 10 bedded Hospital at Manimajra, 25 Allopathic dispensaries, 3 Ayurvedic dispensaries and two mobile units for rural area and labour colonies. The number of beds in General Hospital is being raised to 500 beds and Manimajra hospital to 38 beds. During the 6th Five Year Plan it is proposed to add a 500 bedded hospital in the Northern sector, 5-new allopathy dispensaries in the rural area and 2 E.S.I. dispensaries. A neo-natal unit in General Hospital and a Poly-clinic in Health Centre, sector 22, are also proposed to be added by the end of the Sixth Plan.

Transport. Chandigarh Transport Undertaking operates a fleet of 207 vehicles in the Union Territory. 20 buses are to be added during the current financial year and 20 more during the next year. The main bus stand in sector 17 has been expanded by the addition of 4 new platforms. A new bus depot is proposed to be set up in sector 25 to provide for quick repairs and easy servicing to the fleet.

Education. Chandigarh strives to keep up its reputation as the most literate city in India by providing the best educational facilities available. It has 9 Degree Colleges, 45 High/Higher Secondary Schools, 26 Middle, 41 Primary and 37 Nursery Schools. These institutions are so located as to be accessible to everybody in the territory whether in the city itself or in the rural areas. It is proposed to start two middle schools on model lines and upgrade three middle schools to high level. 54 pre-nursery sections are being added to various schools to accommodate all the children in the age group of 4—5 years.

Education is free up to 10th class in the rural areas. In order to help the weaker sections, free text-books, stationery, uniforms and scholarships to all the scheduled caste children studying from class 1 to 8 are being provided. About 34,000 children are being supplied with mid-day meal packets, 2500 girls belonging to the weaker section and S.T. are getting attendance scholarships.

Rural Development. All the 22-villages of the Union Territory have been linked by metalled roads. Most of the village streets have been paved. Street lights are provided in all villages. Multipurpose Activity Centres have been constructed in 6 villages and flush system community latrines provided in 10 villages.

Tourism Facilities. Chandigarh with its modern facilities, its gardens & avenues and its excellent transport system is itself a tourist magnet. In order to provide more diversions to tourists the Sukhna Lake is being further developed with the provision of camping sites, cafeteria, swimming pools, beer bars and tennis and shuttle courts.

Accommodation is at present available in the Union Territory State Guest House which is fairly commodious. In addition, Indian Tourism Development Corporation is building a 3-star hotel. A low-cost tourist hotel with accommodation for 600 persons is also proposed to be built. Over and above these, many private parties have been allotted sites in various sectors to put up hotels of their own. Altogether, Chandigarh will be able to accommodate thousands of tourists in a few years. Chandigarh Tourism Department has introduced a brand new Tourist Coach for extending the facility to tourists, of local sight seeing daily and tour to historic Yadvindra Garden at Pinjore on every Sunday at nominal rate of fare. Daily two trips are arranged for showing places of interest like, Rose garden, museum, art gallery, University campus, Secretariat, Assembly chamber, High Court, Lake, Rock Garden, National Gallery of portraits etc.

183. DADRA AND NAGAR HAVELI

Dadra and Nagar Haveli is a small Union Territory having 491 sq. km in area near the west coast surrounded by the states of Gujarat and Maharashtra. Above 81% of the population consists of tribals. The Territory is made up of two pockets, namely Dara and Nagar Haveli which are separate. Silvassa is the District headquarter. The Territory is uni-district.

The territories of Dadra and Nagar Haveli were originally assigned to the Portuguese by the Maratha Government in 1779 for an aggregated revenue of Rs. 12,000/ in return for their friendship. The Portuguese ruled this territory till its liberation in 1954. After liberation, the Administration was carried on by an Administrator chosen by the people themselves. Probably this is the only part of the country which was ruled by the people themselves for about 8 years (1954 to 1961). On the 11th August, 1961, the territory was integrated into the Indian Union. The first Group Panchayat at the village level was established in 1968 and thereafter elections are being held regularly every four years.

People. The Territory is entirely a tribal one, consisting of 72 villages, of which 6 villages will go under submergence of Damanganga Reservoir Project. The tribals live in scattered hamlets mainly on their agriculture fields. The houses are built of local materials readily available from the nearby forests with thatched roof. Normally men wear a short dhoti or loin cloth and shirt. Women's dress consists of a blouse and a long or short sari. All tribal women are fond of ornaments which are mostly of brass, silver or copper. Glass beads are apparently the most popular wear of the women.

Language. As per 1981 Census, 83 per cent of the population speak Bhilli/Bhilodi language, 12 per cent speak Gujarati, 2.29 per cent speak Marathi and 1.58 per cent speak Hindi.

Agriculture. Agriculture is the principal occupation of Adivasis. Paddy and Ragi are the two major food crops, while wheat, small millets etc. are also grown in some areas. Cultivation depends almost entirely on rainfall. Only about 21,400 hectares were irrigated during 1982–83. The Administration is trying to modernise cultivation and increase production. Fertilizers, implements, bullocks etc. are being supplied at subsidised rates. Loan subsidy is also given under various schemes.

Forest. Forests of the territory contain valuable trees like teak, khair, sadad etc. and provide minor forest products like bidi leaves, mahuda flowers, karani seeds, gum etc.

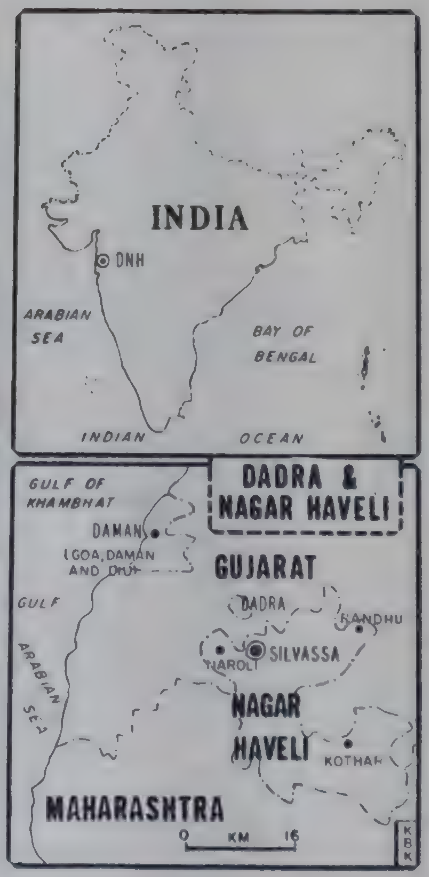
The present forest area is 20,205 ha. which form about 41.23 per cent of the total area of the territory. During the year 1982–83, khair, teak and plantations were raised over an area of 771 hectares. It is proposed to raise khair and teak plantations over 700 ha. under various plan schemes during 1983–84

Revenue earned by the Forest department forms the major part of the total revenue of the territory.

Animal Husbandry. There is one Veterinary Hospital at Silvassa, and five Veterinary Aid Centres located in interior area of this territory. Free treatment is given to the livestock of the territory at these centres.

There is one Govt. dairy demonstration farm with 4 jersey bullocks & 29 buffaloes, one bull rearing farm and one piggery unit at Silvassa.

The poultry farm at Silvassa provides sufficient number of improved variety of birds to the people. There are 73 small poultry units and 52 big poultry units. Three farmers Co-operative Societies are functioning in different villages.



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Public Health. There are at present one Cottage Hospital and 5 sub-centres and five dispensaries in the remote area of the territory. There is also one mobile dispensary, to provide door-step medical facilities to poor tribals. The entire territory is covered under Multi-purpose Health Workers Scheme and all rural health programmes including Family Welfare Programme are being implemented through the network of these medical units and front line workers.

Irrigation. This is no major or minor irrigation project in this territory. However, Damanganga reservoir project, a joint venture of the Govt. of Gujarat, Goa, Daman and Diu is being executed by the Govt. of Gujarat. With the completion of the project, about 8280 hectares of land of this territory will be brought under irrigation.

Minor irrgiation activities include 22 lift irrigation schemes, 8 open irrigation wells and 15 check dams, 8 lift irrigation schemes and 10 open irrigation wells are under progress.

Power. There is no generation of electricity in this Territory. Power is purchased from Gujarat Electricity Board.

Out of 72 villages of the Union Territory, 62 are electrified. Work is under progress for electrifying 4 more villages, the rest of the villages are to be submerged under the Damanganga Reservoir Project. Power connection was given to 132 industrial units upto Nov. 1982.

Co-operation. There are 34 Co-operative Societies with 21978 members. All the Agricultural societies cover 72 villages, to render financial assistance to the poor Adivasis. All the Service societies are giving short term and medium term loans to its members.

Education. There are 141 Government Primary Schools and 12 Government aided and one un-aided Mission Primary School. The administration is also running 13 Pre-Primary schools, 11 Govt. Pre-Primary and 2 Private where 607 children are enrolled.

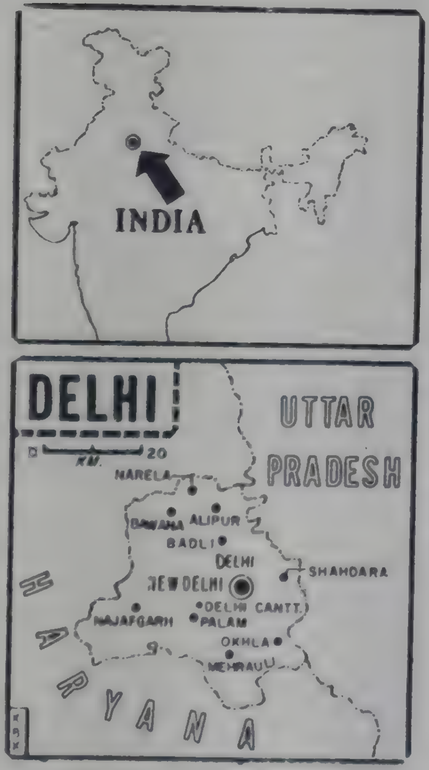
There are two Higher Secondary Schools, one each at Silvassa and Naroli and 5 High Schools. There is no college. Education is free upto Higher Secondary level and free mid-day meals are provided at Pre-Primary and primary schools. Students upto Higher Secondary stage belonging to the SC/ST and the economically backward are provided with clothes, text-books and other stationery items. There are 9 Social welfare hostels of which 2 are exclusively for tribal girls. About 555 students are residing in these hostels. Lodging and boarding is provided free of cost by the administration. Under the Adult Education Programme, 49 centres are functioning with a total enrolment of 1454 students during this year 1982–83.

Industries. There is no large scale industry in this territory. Three industrial estates, one on co-operative basis and two Govt. Industrial Estates located near Silvassa and in Masat village and the third one in village Khadoli. There are 133 SSI Units including 3 medium scale industries, generating employment for about 3000 persons. The products manufactured include spectacle frames and parts, cotton and art silk fabric crimped yarn, foam projects, detergent powder, confectionery biscuits, candles, flooring tiles, spun pipes, and corrugated boxes etc. The entire territory is declared as a backward area and as such various concessional facilities are available to industries.

184. DELHI

The territory of Delhi shines with the reflected glory of a metropolis that functions as the capital of India. But beyond the confines of the metropolis and shorn of its imperial associations, this Territory is no better than any other Territory of India. The territory forms an enclave inside the eastern frontier of Haryana in North India.

The climate of the Territory is influenced by its inland position with the desert of Rajasthan to the West and South-West and Gangetic plains of U.P. to the East. Extreme dryness with an intensely hot summer and cold winter are the characteristics of the climate. The year can broadly be divided into four seasons. The cold season starts in late November and extends to about the beginning of March. This is followed by the hot season which lasts till about the end of June when the monsoon arrives. The monsoon continues into the last week of September. The two post-monsoon months October and November constitute a transition period from the monsoon to winter conditions.



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History. The city of Delhi was founded in the 11th century AD by a Rajput Chieftain of the Tomara clan. The Chauhans obtained possession of the city from the Tomaras. Prithvi Raj, the Chauhan ruler of Ajmer and Delhi, made the city of Delhi famous by his heroic valour and romantic adventures. Delhi under Prithvi Raj and Kanauj under Jai Chand were the principal kingdoms of north India at the time. There was keen ravalry between the two. Prithvi Raj brought matters to a crisis by carrying off Sangojata, the lovely princess of Kanauj as his bride rather in the manner of the Scottish hero, Lochinvar. This widened the breach between Delhi and Kanauj. It is said that Jai Chand was instrumental in persuading Muhammud Ghori of Afghanistan to invade India. Some historians doubt the veracity of this allegation. But whatever that may be, there is no doubt that the invasion of Muhammud Ghori had far-reaching political consequences, not only for Delhi but for the rest of India as well.

The first invasion of India by Muhammud Ghori was beaten back by Prithvi Raj in the first battle of Tarain in 1191. Next year, Ghori came back to avenge his defeat and in the second battle of Tarain (1192) the Rajput army was routed. Prithvi Raj was captured and put to death. Delhi thus passed into the hands of Muslim rulers for the next six centuries. Under the Mughal Emperors, Delhi became a world famous city.

In 1857, following the mutiny of Indian troops, the British deposed the titular Emperor Bahadur Shah and formally annexed Delhi. In 1912, the capital of British India was transferred from Calcutta to Delhi. A new city—New Delhi—of imposing dimensions was laid out by the side of the old city—Old Delhi—by the British Indian Government. Independent India has retained this historic capital.

Administration. Delhi became a Union Territory on November 1, 1956. In order to enable a larger measure of association of the representatives of the people of the Union Territory with developmental activities, parliament enacted the Delhi Administration Act, 1966. Under this Act, Delhi has an elected Metropolitan Council consisting of 61 members, five of whom are nominated by the President of India.

The Lt. Governor is the Administrator. He is assisted by 4 Executive Councillors (one Chief Executive Councillor and three Executive Councillors) appointed by the President of India on the recommendation of the Union Home Ministry.

The Territory is made up of 3 towns and 258 villages and is represented by 7 members in the Lok Sabha and 3 members in the Rajya Sabha. The Territory is covered by 3 local bodies—Delhi Municipal Corporation, New Delhi Municipal Committee and Cantonment Board.

Table 245

Administrative Units

Name	*Urban/ Rural*	*Population 1981*
New Delhi Municipal Committee	(Urban)	271990
Delhi Cantonment Board	(Urban)	90663
Municipal Corporation of Delhi	(Urban)	4865077
	(Rural)	968684
Total population.		6196414

Area. Delhi has an area of 1,485 sq. km —446 sq. km urban, 1039 sq. km rural. In the rural area of Delhi there are 241 inhabited and 17 deserted villages in 5 community development blocks. At the 1981 census its population was 6,220,406 persons. The density of Delhi is also high being 4194 persons per sq. km. the highest in all India.

Economic Activity. In Delhi 30 per cent of the total population constitutes workers (1971 census). Percentage distribution of workers according to main activity revealed that other services constitute 36.74 per cent, manufacturing (other than house-hold industry) 21.46 per cent, trade and commerce 19.91 per cent, transport, storage and communication 9.36 per cent, construction 5.3 per cent, cultivation 2.62 per cent, house-hold industry 2.28 per cent, agricultural labourers 1.24 per cent and mining, quarrying, livestock, forestry etc. 1.09 per cent.

Literacy. Delhi ranks third in literacy after Kerala and Chandigarh which hold the first and second positions. Percentage of literacy in 1981 was 61.54 (68.40% of males and 53.07% females).

The total number of educational institutions in 1980—81 was 4421 with an enrolment of 1,411,869 students.

Scheduled Castes. According to 1971 Census, Scheduled, Castes constituted 15.6 per cent of the total population of Delhi. The areawise Scheduled Castes population is given below:

Table 246

Region (1971)	*Males*	*Females*	*Total*
Delhi (Urban)	295492	235207	530699
Delhi (Rural)	57528	47471	104999
Total Population	353020	282678	635698

Land. Delhi has a total land area of 147,488 hectares of which 1434 hectares are forest, and 47123 hectares are not available for cultivation. Other uncultivated land, excluding fallow, comes to 2016 hectares (1971—79).

The Delhi Land Reform Act, 1954 provides for the abolition of landlordism and the conferment of ownership on all tenants and sub-tenants. Over 8000 tenants of diffeent categories have acquired ownership right in an area of about 38,000 acres.

Agriculture. The contribution to the economy is not significant. About 87,599 ha. are cultivated. Chief crops in 1980—81, production (in 1000 tonnes) were: wheat 120: jowar and bajra 14: gram, 1: sugar cane (gur) 0.3.

Livestock. In 1977 the Territory had a livestock population of 205,731 out of which cattle numbered 48,290 and buffaloes 108,924. Poultry population came to 216,911.

Table 247

Cattle	48290
Buffaloes	108924
Other Animals	
Sheep	9276
Goats	19869
Pigs	10489
Horses & Ponies	4356
Camels	354
Miscellaneous Livestock	4173
Total Livestock	205731
Poultry	216911

Milk Supply. Delhi is well developed in dairying. There are two main agencies

(Delhi Milk Scheme and Mother Dairy) supplying milk.

Table 248

	Delhi Milk Scheme		*Mother Dairy*	
	1979	*1980*	*1979-80*	*1980-81*
No. of Milk Depots	1101	1058	260	293
Daily average (in kilolitres)	153	146	239	233

Source: Livestock Census 1977.

Industry. Since 1974 a large number of industrial concerns have been established. These include factories for the manufacture of razor blades, sports goods and parts for radios, bicycle and station wagons, plastic and PVC goods including footwear. The number of industrial units functioning was about 45,000 in 1980−81. The number of workers employed was 450,000, production was worth Rs. 2,196 crores and investment was about Rs. 867 crores.

Some traditional handicrafts for which Delhi was formerly famous, still flourish. Among them are ivory carving, miniature painting, gold and silver jewellery etc. The handwoven textiles of Delhi are particularly fine, this craft having been successfully reivived.

Transport and Communication. Delhi naturally occupies a pivotal place in the net-work of national railways, highways and airways. It is one of the biggest railway junctions in the country. All the principal inter-State roads converge on Delhi. It has two airports, Palam and Safdarjung which link Delhi not only to the different cities of India but also to all important cities in the world.

The Delhi Transport Corporation is the main transport agency within the city. The daily average number of buses of the Corporation on the road was 2543 and the average daily distance covered was 5.7 lakh km.

Table 249
Economic Census 1980

(Provisional Results)

	rural number	*per cent*	*urban number*	*per cent*	*total number*
1. Agricultural enterprises					
(a) total	3036	48.1	3275	51.9	6311
(i) establishments	1148	53.6	995	46.4	2143
(ii) own account enterprises	1888	45.3	2280	54.7	4168
(b) persons usually working in enterprises					
total	7263	44.8	8949	55.2	16212
hired workers	2099	41.3	2984	58.7	5083
2. Non-agricultural enterprises					
(a) total	24241	8.7	253170	91.3	277411
(i) establishments	5550	4.8	109682	95.2	115232
(ii) own account enterprises	18691	11.5	143488	88.5	162179
(b) persons usually working in enterprises.	65615	4.7	1323857	95.3	1389472
Total hired workers	35232	3.5	980980	96.5	1016212

Table 250
Labour and Employment

Description		*Period as on 31st March*			
	Unit	*1977*	*1978*	*1979*	*1980*
Employment in Public Sector	No. in lakhs	4.81	4.85	5.06	5.04
Private Sector	....	1.69	1.73	1.83	1.80
Total	....	6.50	6.58	6.75	6.84
Employers using employment					
Employment	In '000	9	9	9	8
Exchanges	No.	16	16	16	16
Registration	in '000	165	183	185	183
Applications placed	,,	58	54	60	66
Vacancies notified	,,	79	68	72	77
Applicants on the live register at the end	,,	225	251	281	307

Table 251
Education

Educational Institutions	Nos.	Boys	Girls
		1979—80	
Universities	2	10801	9490
Deemed Universities	2	2461	1200
National Institutions	2	2849	382
Research Institutions	2	52	1
Colleges (General)	51	34006	25812
Colleges (Professional)	17	4936	1889
Under-Graduate Colleges	26	8795	3796
Higher Secondary Schools	678	320868	250993
Middle Schools	325	56365	36346
Primary Schools	1677	299738	259796

Public Health: Delhi is well up in medical facilities and health services.

Table 252
Medical Facilities—1980

Institutions	Nos.	Beds Nos.
General Hospitals	37	9138
Special Hospitals	20	3249
Ayurvedic Hospitals	4	300
Unani Hospital	1	96
Homeopathic Hospital	1	100
Clinics	110	942
Dispensaries (all types)	445	—
Maternity & Child Welfare Centres	141	213
Primary Health Centres	8	80
Total	—	14118

185. GOA, DAMAN & DIU

Physiography. Goa, Daman & Diu are three different landblocks on the west coast of India lying far apart from one another. They have come to form one political unit after their liberation from the erstwhile Portuguese regime and have been added as such to the Indian Union.

Goa is situated between the coastal borders of the Karnataka and the Maharashtra States. It is bounded on the north by the Terekhol river, on the east and south by the land boundaries of the Karnataka State and on the west by the Arabian Sea. While Daman lies on the Gujarat coast, Diu is an islet on the southern fringe of the Kathiawar peninsula.

Goa is hilly terrain especially on its eastern side where lies the northern end of the Sahyadri range. The important rivers flowing westward and providing a network of internal waterways are Mandovi, Zuari, Terekhol, Chapora and Betul, which are navigable for a total length of 253 km. The physiographic characteristics are rich and varied consisting of verdant hills, forests, coconut groves and rice fields. The most picturesque region is located in the lower basins of the Mandovi and Zuari.

Daman is bounded on the north and south by the Bhagwan and the Kalem rivers respectively, on the east by the Gujarat State and on the west by the Arabian Sea. It is divided by the Damanganga river into two distinct parts. Three westward flowing rivers pass through the territory, namely, the Bhagwan river running along the northern boundary, the Kalem river forming the southern boundary and the Damanganga river lying in between.

Diu, a tiny islet in the gulf of Cambay near Veravl port, is separated from the southern extremity of the Saurashtra peninsula by a narrow channel running through a swamp. The island is connected with the mainland by a narrow channel on the north. The channel is navigable only for fishing boats and small country-craft. The topography is generally plains, the hillocks attaining a maximum height of 30 metres. This small excellent harbour enables vessels to lie at anchor in two fathoms of water.

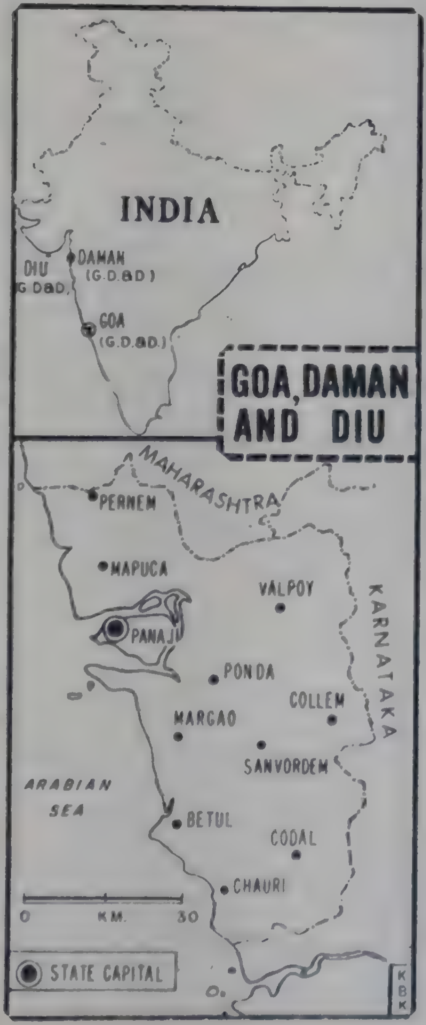
Climate. The climate of Goa is warm and humid. There is little variation in temperature over the year. The normal rainfall varies from 90 to 120 inches (2800—3500 millimetres) and the year-round temperature ranges from 70° to 90° Fahrenheit (22° to 32° Centigrade). Daman has a mild and humid climate, while Diu island has a sultry climate.

History. Goa was a centre of maritime trade from very ancient times. Politically, it remained a feudatory of the great Deccan powers, one after the other. The Satavahana dynasty held sway over Goa and nearby areas from the 2nd century B.C. In the 6th century A.D. Goa passed under the Chalukyas of Badami, who became supreme in the Deccan. In the 8th century (A.D. 753) the Rashtrakutas displaced the Chalukyas. In the 10th century (A.D. 973), another branch of the Chalukyas, the Chalukyas of Kalyani, overthrew the Rashtrakutas and established their suzerainty in the Deccan. In the 11th century (A.D. 1020), the Kadambas came into power in the west coast. The Goa Kadambas were a great maritime power.

From the 13th century, the Kadamba

kingdom was subjected to various attacks from the Yadavas of Devagiri, and from Muslim powers, especially, the Bahmani Sultans (1349—51). In the 15th century Goa became part of the Vijayanagar Empire but was once again conquered by Bahmanis in 1471. When the Bahmani Sultanate broke up, Goa came under the Adil Shahi Sultans of Bijapur from whom the Portuguese captured Goa in 1510.

Alfonso de Albuquerque, the Portuguese Governor at Goa, made it the headquarters of the Portuguese possessions in India. In 1531 Daman on the Gujarat coast, 70 miles from Bombay, was seized by the Portuguese. In 1539, the Shah of Gujarat formally ceded the territory to the Portuguese. The island of Diu, off thè south-east coast of Kathiawar (Gujarat) was captured in 1534. Under the Portuguese, Goa prospered greatly in trade. In 1843 the city of Panaji in Goa was made the capital of Portuguese India.



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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

The Portuguese territories of Goa, Daman and Diu were liberated from foreign rule by the jawans of the Indian Union on Dec. 19, 1961. Under the Constitution (Twelfth Amendment) Act, 1962, G D D was included in the First Schedule to the Constitution as a Territory of the Indian Union.

The Constitution (14th Amendment) Act 1962 introduced Article 239-A in the Constitution of India, which empowered Parliament to enact laws for the creation of Legislatures and Councils of Ministers for the Union Territories of Himachal Pradesh, Manipur, Tripura, Goa, Daman & Diu and Pondicherry. In pursuance of this Constitutional Amendment, Parliament enacted the Government of Union Territories Act 1963. The present Union Territory of Goa, Daman and Diu with a Legislature and a Council of Ministers and its own Consolidated and Contingency Funds came into existence on December 20, 1963.

One of the first political controversies to raise its head in Goa was the question of merger with Maharashtra. Opinions on this question were sharply divided. The Government of India decided to take an opinion poll and settle the question accordingly. In 1966, Parliament enacted the Goa, Daman and Diu (Opinion Poll) Act. In accordance with the provisions of the Act, an Opinion Poll was held in Jan. 1967 to ascertain whether Goa, Daman and Diu wanted to be a Union Territory or to merge with the adjoining States of Maharashtra and Gujarat. Goa, Daman and Diu voted to continue as a Union Territory.

Administration. The Goa region has been declared as one district with a district magistrate, and two subdivisions—Panaji and Margao and II Talukas. Daman and Diu have no subdivisions. The Daman region is under the charge of a Collector while Diu is under the charge of a Civil Administrator.

Table 253

Area, Population and Headquarters of Districts

District	*Area* *(sq. km.)*	*Population** *(1981)*	*Head-quarters*
Daman	72.0	48,560	Daman
Diu	40.0	40,321	Diu
Goa	3701.0	1007,749	Panaji
Total	38130	1096,630	

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* Provisional

Agriculture. Paddy is the staple crop of the territory covering 32763.80 ha of land of which 9488 ha. are under rabi and 23275.80 ha. under kharif

Ragi is the next important food crop covering 6405 ha. Area covered by other cereals, millets and pulses is 26511 ha.

Note: Since paddy cultivation became costly, some agriculturists turned to cash crops, i.e., Sugarcane, Coconunt, Banana etc., and thus the total area under paddy and ragi is slightly reduced.

Irrigation. Before the liberation of the Territory, 7000 ha area was irrigated. With increased number of wells and lift irrigation projects, the area irrigated at present is 13,500 ha. With a view to bringing large areas under irrigation, three projects have been taken up, namely, Salualim in Sanguem taluka and Anjunem and Mandovi in Sattari taluka. Work of Tillari project which is an inter-state project with a command area of about 17000 ha. in talukas of Pernem, Bicholim and Bardez is also being carried out.

Forests. The total Govt. forest area is estimated to be 1053 sq. km which is confined only to the district of Goa. There are no natural forests in Daman and Diu.

Scientific management and development of forests of this territory was started in 1963—64 soon after liberation. Since then considerable progress has been made in forestry and wild life management. Under a large scale plantation programme various species were planted—teak 9175 ha., eucalyptus 5232 ha., rubber 527 ha., cashew 9511 ha., and other miscellaneous species.

Greater stress is being paid to Social Forestry and Wild Life Management for which purpose three Game Sanctuaries have been constituted in this territory.

Animal Husbandry. Total livestock population (as per Livestock Census, 1982)

Table 254

Cattle	129669
Buffaloes	43617
Sheep	601
Goats	20156
Horses & Ponies	65
Donkeys	78
Pigs	77900
Mules	2
Total livestock	261,256
Total Poultry	615,592

Table 255

Supply of Milk, Eggs & Meat

		(1981—82)
Estimated annual production of milk	20,000	tonnes
Capacity of Dairy plant (Ponda)	10,000	litres/day
Milk distributed through Govt. Dairy	42.40	Lakh litres
Estimated annual production of eggs	180	million eggs
Total net weight of meat produced	3740	tonnes

Fisheries. Nature has endowed Goa with considerable marine and inland fisheries potential. This territory has a 100 km coastline, 200 km – long inland waterways and a number of small fresh water tanks covering an area of 100 hectares. The coast is full of creeks and estuaries providing good shelter for fishing craft. The coastal and inshore waters of Goa are known to be rich in aquatic resources, and shoals of mackerels and sardines regularly visit the shores.

Table 256

Fisheries

	1978-79	*1980-81**
Marine fish catch		
Quantity in tonnes	32,917	22,427
Value in lakhs Rs.	590.63	602.25
Fish Canned		
Quantity in tonnes	90	97
Value in Rs. '000	707	980
Fish Frozen		
Quantity in tonnes	310	547
Value in Rs. '000	14,487	18,841

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* Provisional.

Minerals. The discovery of bauxite deposit in Goa has given a new dimension to the mineral wealth of this Territory. Mineralogically Goa bauxite is a trihydrate unlike the other bauxites of Indian origin. The chemical grades vary from the low metallic grade to a very pure chemical type. The intermediate grade is in good demand in foreign countries.

Goa has long been known as a centre of mining especially of iron ore. Some of the biggest industrial houses of India are located in Goa.

Mining

Ore exports	*1981-82* *(in metric tonnes)*
Iron Ore	13,036,143
Manganese ore	
Ferro-Manganese ore	70,328

Source: Mormugao Port Trust, Mormugao. (Data furnished on 31-3-'82)

Power. Goa has no source of power generation. The neighbouring states of Karnataka and Mahrashtra have been supplying electricity to Goa. Power used in Daman & Diu is provided by Gujarat Electricity Board.

		1981-82
Electricity consumed (sold)	MU	260.00
No. of Census Villages Electrified up to March 1982	Nos.	395
No. of towns Electrified upto March 1982		17
Per Capita consumption of Electricity	KWH	269
Percentage of Industrial consumption to total consumption of Electricity	%	72.17

Literacy & Education. With a literacy percentage of 55.86 Goa stands fifth among the States and Territories of India. The Territory is well-equipped with educational institutions.

Table 257

Educational Institutions

Number of Schools:	*1981−82*
Primary	1233
Middle	395
High Schools	256
Higher Secondary	20
Number of Clleges	18
General Education:	
Professional Education	31
No. of Post-Matric level instns.:	
Professional/Technical	9
No. of School level Instns.:	
Professional/Technical	9
School Enrolment:	
Primary	133,623
Middle	71,250
Secondary	48,102
Higher Secondary	7,702
Enrolment in Colleges:	
General Education	6970
Professional Education	6959
Enrolment in Post-Matric level Institutions	531
Professional/Technical	1530
Enrolment in School-level Institutions:	
Professional/Technical	2505
No. of Teachers in School *(by stage)*	
Primary	4292
Middle	2281
Secondary	2422

Industries. The actual beginning of industrialisation in the territory may be traced to the Fourth Five-Year Plan. Since then, there has been a steady growth in the number as well as in the size of industries. This is mainly due to the development of infrastructure and communications which have greatly helped the progress of industrialisation. From a trading economy prevailing during the pre-liberation period, the territory has switched over to an industrial economy. The development relates not only to the number of units but also to a wide range of products.

By the end of March 1981, the size of the industrial base assumed broad dimensions. There are 31 large and medium units employing around 5100 persons covering a capital investment of more than Rs. 138 crores. These include a fertilizer plant, pesticides, sugar factory, textile mill, tyres and tubes, chemicals, industrial gases, pharmaceuticals, iron ore pellets, distilleries etc.

At the end of March 1982, the number of registered small scale units increased to 2416 employing 17769 persons. This sector has taken on some new sophisticated type of industries like drugs and pharmaceuticals, fasteners, PVC footwear, nylon fishing nets, batteries, cutting tools, capacitors, welding electrodes, coir defibring, diamond cutting tools, industrial valves and furnaces.

On the export front too, the small scale industries have registered continued progress.

Table 258

Industrial Units

Total No. of factories registered under Factories Act	283
Total No. of factories in operation, registered under Factories Act	212
Estimated average of daily workers employed in registered factories	58
Total No. of small scale industrial units	2416

Source: Dept. of Industries and Mines

Public Health

Table 259

Medical Facilities 1981−82

Government hospitals*	33 (a)
Government hospital beds*	2313 (a)
Health Centres including Sub-Centres*	207 (b)
Family Planning Units*	157
Maternity and child welfare Centres & Dai-Centres*	28
Patients treated indoors	51605 (P)
Patients treated outdoors	692356 (P)

Note: (P) Provisional

(a) Military and Navy hospitals have not been covered

* Data furnished is as on 1-1-1981

(b) Under this item, it includes 33 hospitals (State, Central, Semi-Government) and attached to Primary Health Centres, 5 Urban Health Centres, 109 Sub-Centres, 31 Rural Medical Dispensaries, 29 M.C.W. and Dai Centres

186. LAKSHADWEEP

The Laccadive, Minicoy and Amindivi islands (renamed Lakshadweep from 1-11-1973) constitute the smallest Union Territory in India. These islands were part of the State of Madras until the reorganisation of States in 1956. On 1st November 1956 they were constituted into a separate Union Territory.

Administration. The Territory is an archipelago of coral islands and open reefs lying scattered in the Arabian sea, some 200 to 400 km to the west of Kerala. There are in all 27 islands, of which 17 islands are uninhabited.

Table 260

Area and Population

Island	*Area (Sq. km)*	*Population (1981 Census)*[*]
Minicoy	4.4	6658
Kalpeni	2.3	3540
Andrott	4.8	6870
Agatti	2.7	4108
Kavaratti	3.6	6608
Amini	2.6	5367
Kadmat	3.1	3112
Kiltan	1.6	2373
Chetlat	1.0	1483
Bitra	0.1	181
Total	32	40237

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[*] Provisional.

The population, according to the 1981 census, is 40,237.

Agriculture. The staple products of the Territory are coconuts and coir. Coconut is the main crop occupying the entire cultivable area of 2776 hectares. The total palm population is 0.57 million with 0.5 million bearing trees. The average production is 8320 nuts per hectare per year with an average yield of 45 nuts per palm which is definitely higher than the average production figures of the major coconut producing countries.

Fruit plants like banana, papaya, guava, sapota, and citrus varieties and drumstick plants are cultivated in the coconut gardens as inter-crops. Agricultural Demonstration Farms of the Administration in all islands supply vegetables to people.

Multi-crop demonstration plots extending to 200 hectares engaging 330 labourers were started in 9 islands during the Khariff season 1979–80

The islands produce copra, coir, jaggery, vinegar and fish. Trade in coir is a monopoly of the Administration and is being carried on as a welfare measure on a no-profit-no-loss basis, by bartering rice for coir. The average copra produced is about 1900 tonnes per annum, of which 1400 tonnes is sold through Calicut and Mangalore markets.

The islands have immense potential for the development of fisheries. Two Boat Building Yards are engaged in construction of mechanised boats in Lakshadweep. Over 300 mechanised boats are under operation in Lakshadweep waters. They were issued to the fishermen under a subsidised hire-purchase system. Fish catch during 1980–81 is estimated at 3100 tonnes. The canning factory at Minicoy processes the fish catch.

Animal Husbandry. Poultry and Dairy Units have been started in some of the islands. There are poultry farms at Kavaratti, Minicoy, Androth &Agatti and smaller units in some other islands, from where birds and eggs are sold to the people. There are dairy units at Kavaratti and Minicoy from where milk is also sold. Veterinary clinics are provided at Kavaratti Minicoy & Androth islands.

Power. Out of the ten inhabited islands, nine had been electrified by April 1974. The remaining island Bitra, the smallest island of this Union territory, is expected to be electrified during the 6th plan-period. Twenty-four-hour electricity supply is available at Kavaratti and Minicoy islands now. This facility will be extended to the remaining islands also during the 6th five-year plan.

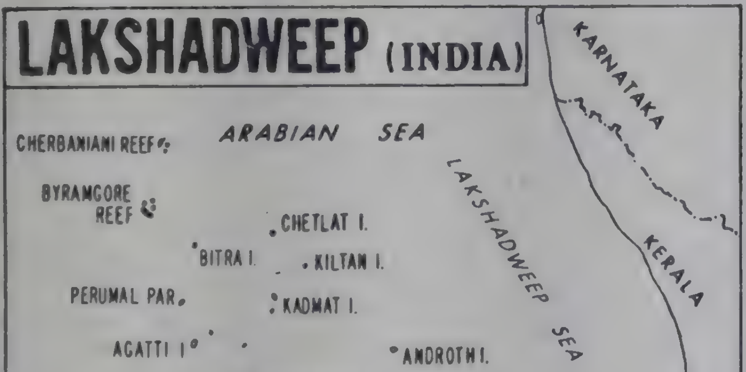
Industry. The main household industry is coir twisting. Four Coir Production-cum-Demonstration Centres are functioning, one each at Kadmat, Kiltan, Amini and Androth with a total strength of 71. These centres produced 36 tonnes of improved variety coir yarn in 1979–80 The mechanical decorticating units at Androth and Kadmat extracted 62 tonnes brown fibre from dry coconut husk during 1980–81. The hosiery factory at Kalpeni produced 11600 nos. of baniyans and drawers. The Handicraft Training Centres at Kavaratti and Kalpeni are continuing to impart training to local candidates in making coral flowers, sea shell toys, coconut shell crafts, coir craft etc. One Furniture Makers Industrial Co-operative Society and one Handicraft Industrial Co-operative Society are also functioning at Kavaratti. One Coir Training Centre for giving training in the production of thinner coir has been started at Agatti island. This centre imparts training to a batch of 30 local women for a period of 6 months. A Coir Co-op. Society has been started at Amini with trained local women as members.

Education. Education is free at all stages. Lakshadweep, in spite of its backward conditions, has achieved a good rate of literacy with 54.72 per cent (1981). The total no. of educational institutions in the islands is 40 in all comprising one Junior College, 8 High Schools, 5 Senior Basic Schools, 17 Junior Basic Schools and 9 Nursery Schools. Jawaharlal Nehru College has a student strength of 246 in the two pre-degree classes. There are 2 Boys hostels and 2 Girls hostels in the islands. Free boarding and lodging are provided to the students who have no facilities for studies in their native islands. Full scholarships are also given to island students studying in the mainland for higher education.

Public Health. Medical care is provided to people in all the ten inhabited islands free of cost through two hospitals, seven Primary Health Centres and one first-aid centre. The scheme for granting financial assistance to the local people requiring specialised treatment in the mainland hospitals is continuing. Two Ayurvedic dispensaries have ben set up by the Administration at Kavaratti and Androth islands.

Family Welfare programmes are also introduced in these islands. A local lady doctor has been trained and appointed as Obstetrician and Gynaecologist at Headquarters hospital, Kavaratti.

Owing to a massive immunisation programme, the incidence of major communicable diseases has been checked and greatly reduced in the Territory. Though chicken pox cases were noticed here and there, the Territory has been free from small pox for some years. There has been a steady decline in the incidence of major disease like T.B., Filaria, Leprosy etc.



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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

Transport and Communication. Two ships, M.V. *Amindivi* and M.V. *Laccadives*, have been maintaining mainland services and inter-island communication. As these two ships alone could not transport the increasing quantity of cargo M.V. *Vishwa Vinay* of the Shipping Corporation of India was chartered by the Administration for transport of cargo alone from Cochin and Calicut ports to the various islands.

Each island has a Wireless Station of the P & T Department. Kavaratti, Minicoy, Androth and Amini have local telephone exchanges. The Kavaratti (Headquarters) exchange is connected to Calicut by R/T link enabling trunk calls to any place in India.

A satellite communications station has been established at Kavaratti island. It started functioning from April 1980. Another station is being set up at Minicoy island. R/T stations are also being set up at Androth and Minicoy islands.

Tourist facilities are being developed like the Hotel Corporation of India, a subsidiary of the Air India. Travel Corporation (India) Pvt. Ltd. and Air India have jointly sponsored luxury cruise for foreign tourists to popularise Bangaram islet as a tourist resort.

187. MIZORAM

Mizoram, in the local language, means the *Land of Mizos—Mizo* itself means highlander (mi-persons and zo-hills or uplands). Under the British administration, Mizoram was known as Lushai Hills District. In 1954 by an Act of Parliament the name was changed to Mizo Hills District. In 1972, when it was made into a Union Territory, it was named *Mizoram*.

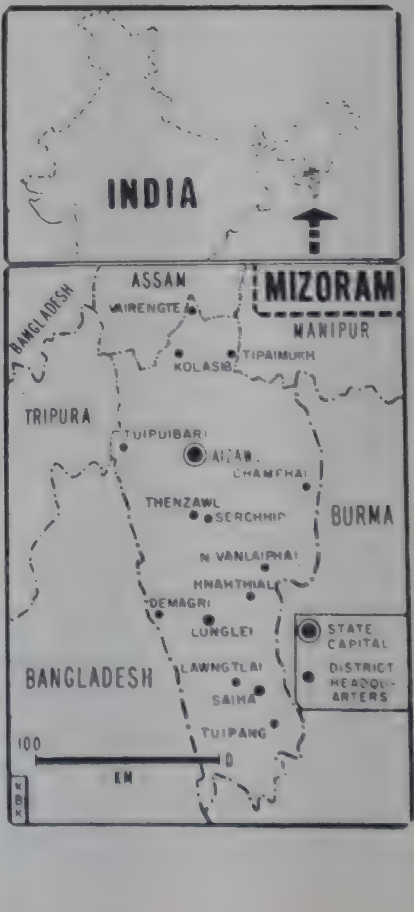
Physiography. Mizoram occupies the north east corner of India. It is bounded on the north by the District of Cachar (Assam) and the State of Manipur, on the east and south by Chin Hills and Arakan (Burma), on the west by the Chittagong Hill Tracts of Bangladesh and the State of Tripura

Mizoram is a land of hills. The hills run in ridges from north to south. They have an average height of 900 metres, the highest point being the Blue Mountain (Peak) in the south which rises to a height of 2165 metres. The hills are steep and cut apart by rivers which have created deep gorges. The terrain, on the whole, is mountainous except for low depressions amid hills, where wet cultivation is practised.

Rivers. The most important and useful rivers are the Tlawng (or the Dhaleswari), the Sonai and the Tuivawl, which drain the northern area of the Territory and eventually join the Barak. The southern area is watered by the Kolodine and its tributaries and the western area by the Karnaphuli with its tributaries. Chittagong in Bangladesh is situated at the mouth of this river.

Climate. The velleys are unhealthy during the rainy season, wet and enervating. In the higher areas, the climate is pleasant, generally cool in summer and not very cold in winter. In March—April violent storms from the north west sweep over the hills. The average rainfall between May and September is 254 cm a year. *Aizawl* in the north records an annual rainfall of 208 cm while Lunglei in the south records 350 cm.

History. The Mizos belong to the Mongolian race. They seem to have settled



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

at first in the Shan State of Burma. Two of the tribes, the Lushai and the Hmars, left Burma and moved westwards into India. They occupied the Lushai Hills.

During the British administration, the Mizos raided British territories and even attacked fortified positions. The British army moved against the Mizos and occupied their territory. It was annexed to British India in 1891. In 1898, the entire Mizo territory was formed into the Lushai Hills District and made a part of Assam. Although the Mizos were subjugated, the British did not interfere with their internal administration. The Mizo Chiefs carried on the day-to-day administration in the traditional manner.

With independence, Mizoram became a district of Assam. The government of Assam, for no apparent reason, chose to neglect the area. While Assam worked out plans for the development of other areas, Mizoram was left out in the cold. The Mizos felt that it was a bad bargain for them to continue as part of India. As dissatisfaction agains the government was mounting, the terrible famine of 1959 descended upon them. The famine was caused by the gorgeous flowering of thorny bamboos—which occur at intervals of 40 to 50 years. The connection between bamboo flowering and famine is explained as follows. When bamboos flower the rats gorge themselves on the bamboo seeds, and multiply at incredible rates. They destroy all crops, thus causing famine.

The famine set ablaze the smouldering fires of discontent. The Mizos broke out into open rebellion in 1966. The Indian army marched into Mizoram and the rebellion was ruthlessly suppressed. The measures adopted to put down the rebellion proved traumatic as far as the Mizos were concerned. The Group Village system enforced by the Indian Army turned out to be particularly disastrous. Under the Group Village system, the Mizos were forced out of their ancestral dwelling places and made to live in larger villages along the main trunk road from izawl to Lunglei. The villagers were to report back every night to the Group villages because a night curfew was prevailing. The consequences was that he Mizos could not properly attend to their farm work as most of the farms were too far away. The amenities provided the Group Villages were also quite adequate, with the result that they soon egenerated into slums.

The conversion of Mizoram into a nion Territory in 1972 did much to ssuage Mizo feelings. Nevertheless, insurgency continued. On Sept. 8, 1974, the Administration declared the whole of the Union Territory as a disturbed area. Further, in view of increasing reports of violence, orders under the Armed Forces (Special Powers) Act—which empowers armed forces to aid civil authorities when necessary—was extended for another six months.

The People. The Mizos are divided into various tribes—the Lushais, Pawis, Paithes, Raltese, Phangis, Hmars, Kukis, Maras, Lakhers, etc. in the 19th century the Mizos came under the influence of British missionaries and many Mizos were converted to Christianity. One beneficial result of missionary activity was the spread of education. The Mizo language had no script of its own. The missionaries introduced the Roman script for Mizo language and started teaching English also. The cumulative result was a high percentage of literacy. Some of the tribes are more educated than the others—the Lushais, for instance, showed a literacy percentage of 86. The majority of the tribes are Christians and speak Mizo and English. But some tribes on the border like the Chaikmas are Buddhist and speak Bengali.

The Mizos are a distinct unit linguistically, culturally ethnologically and in many other aspects. They are dedicated people bent on preserving and consolidating their identity and religion, untrammelled by invidious interference and constraints.

The Territory is tribal. The tribal population (Mizos) comes to 94.25 per cent of the total population (1971).

Administration. Mizoram has a single chamber Legislature consisting of 33 members. The territory has three districts, 9 Sub-Divisions, 3 autonomous Hill District Councils, 6 Towns (as per 1981 census), 23 Police Stations and 301 Village Councils (for Mizoram we have village councils instead of Gram Panchayats)

Table 261

Area, Population and Headquarters of Districts

District	*Area (sq. km)*	*Population (1981)*	*Head-quarters*
Aizawl	12588	340828	Aizawl
Lunglei	4536	86511	Lunglei
Chhimtuipui	3957	66420	Chhimtuipui
Mizoram	 21081	493757	

Mizoram which covers an area of 21,087 sq. km has a forest area of 7127.22 sq. km which accounts for about 34% of the total land area. The types of forest found in Mizoram are the tropical wet ever-green forest. Tropical semi-evergreen forest was once very thick and much valuable and important species were known to exist, but due to large scale practice of jhumming over several generations, these magnificent forests were destroyed in most of the areas and the land rendered barren. Some of the forest areas which were left undisturbed are known to have valuable timber species like Cham, Hallong, Bonsum, Hallack, Gamari, Manrisal, Nahor, Bogipoma, Sam etc.

The State Forest Department has taken necessary steps to regenerate the forest area naturally or artificially through plantation. Apart from the local species, the State Forest Department also introduced in their plantation programme exotic species like teak and eucalyptus. The Department had planted under economic plantation 672 ha before Mizoram attained U.T. status on 21—1—1972 and 2005 ha after it.

Agriculture. Land is the common property of the village and individuals have no separate holdings. Recently, however, lands are being assigned to individuals, so as to organise terrace-farming and orchard plantations.

Agriculture is practically the only occupation in Mizoram. The territory is famous for its fibreless ginger, although other cash crops like mustard, sesame and super-size potatoes are also grown. However, the cultivation method- "Jhum"—is very primitive and destructive. The Mizoram Government is now trying to induce the peasants to change over to more permanent systems of cultivation like terraced farming on the hillsides. There are also schemes to grow plantation crops like rubber, coffee, tea etc.

Paddy is the chief food crop, followed by maize. They are grown on the slopes of hills. One of the chief constraints in increasing agricultural production is the lack of irrigational facilities. Only 2885.30 ha is irrigated in Mizoram.

Animal Husbandry. The livestock population in Mizoram in 1982 is shown below:—

Table 262

Cattle	47,853
Buffaloes	4,294
Mithun	3,114
Pigs	77,134
Sheep	867
Goats	27,545
Horses & Ponies	1,484
Poultry	6,79,312

Power. The total installed capacity in 1982 was 6570 kw. The total number of villages electrified as on 31-3-1982 was 72

Mizoram has abundant hydro power resources. It is, therefore, proposed to take up survey and investigation of prospective hydel power resources which have remained untapped. Investigations have been carried out in the rivers of Tlawng, Mat, Tuirial, Tiau and Tuipui. Reports have recorded good prospects of generation potential of medium and major size.

Industry. There is no major industry in Mizoram, though projects like a 200-tonne-a-day paper mill are being investigated and planned. Besides, a mini sugar plant is proposed to be set up during the 6th Five-Year Plan. Handloom and handicraft are the major industrial activities in the Territory and one Engineering Unit had developed a new design of machine combined ginning and carding.

Apart from this, tailoring, knitting and embrodiery centres are also being set up.

Sericulture. Sericulture was in existence in Mizoram for a long time. Sericulture consists of culture and practice of 4 kinds of silk, i.e., (1) Mulberry, (2) Eri, (3) Tasar, (4) Muga. During 1978—79 raw silk was produced in Mizoram as shown below:—

(a) Mulberry ...	600 kg
(b) Tasar ...	500 kg
(c) Eri ...	1200 kg
(d) Muga ...	600 kg

Other industries are: Ginger beverages, oil, fruits preservation, handloom and some other small scale & cottage industries like bakery, printing press, saw mills, brick making and soap making etc.

Education. Mizoram has an excellent record in education. Its literacy rate at 59.50 per cent is one of the highest in India. In fact, Mizoram is one of the four most literate among the States and Territories of India, Kerala (69.17), Chandigarh (64.68) and Delhi (61.05) being the rest.

In 1982 Mizoram had 1 University Campus under North East Hill University, 11 Colleges, 141 High Schools, 348 Middle Schools, 775 Primary Schools, 1 I.T.I., 1 Blind School, 1 Polytechnic, and 1 Adult Education Centre.

The number of students enrolled in the various institutions in 1981 were as follows:—

Table 263

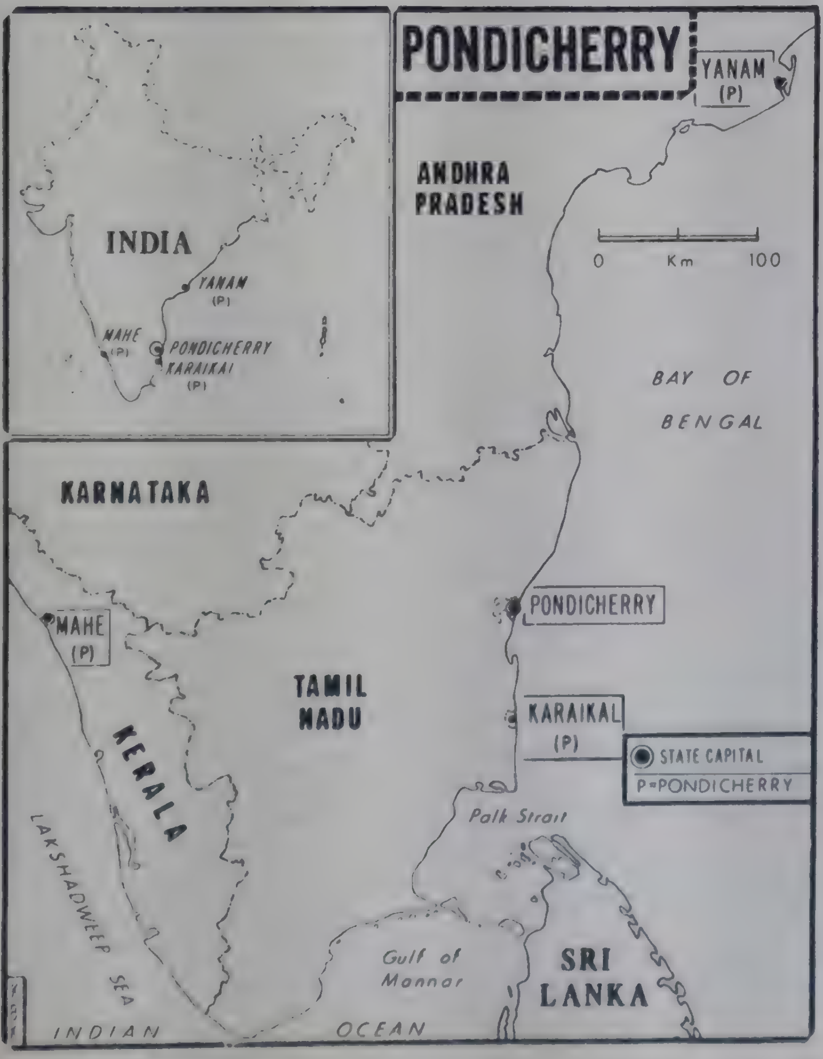
Pre-Primary Primary Schools	78,464
Middle Schools	27,749
High Schools	18,095
Colleges	4,781
University	91
Adult Education Centre	270
Teachers Training School	267
I.T.I.	112
Polytechnic	N.A.
Blind School	8 (approx.)

Health. In 1981–82 there were 7 hospitals, 1 T.B. hospital, 138 Doctors, 187 Nurses, 291 Midwives, 144 Pharmacists, 2 Matrons, 770 Hospital beds, 14 Primary Health Centres 16 Subsidiary Health Centres, 101 Community Health Centres.

188. PONDICHERRY

The Union Territory of Pondicherry includes not only proper Pondicherry but also enclaves of Karaikal and Yanam on the east coast and Mahe on the West coast. Of the total area of the Territory – 492 sq. km. Proper Pondicherry covers 293 sq. km or more than half the area of the whole Territory.

Pondicherry is distinguished from the other areas of the Territory historically too. It has a hoary history going back to the Vedic days, whereas Karaikal, Yanam and Mahe had no sort of historical importance until recent times when they figured as adjuncts to the French Territory of Pondicherry.



Based upon Survey of India map with the permission of the Surveyor General of India
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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

Karaikal, geographically within the Thanjavur District of Tamil Nadu, was originally given to the French East India Company by the local rulers in 1738. It is 160 sq. km in area and is situated on one of the estuaries of the river Cavery.

Mahe is geographically inside the Kerala State on the West Coast and is situated at the mouth of the small river Mahe. It is about 9 sq. km in area and was made over to the French by the ruler of Badagara in 1721. Unlike Pondicherry, Karaikal, or Yanam, Mahe is a hilly area abounding in coconut trees and other greenery characteristic of Kerala.

Yanam is within the geographical boundaries of the East Godavari District of Andhra Pradesh. It is 30 sq. km in area and came into the possession of the French in 1731.

Rivers in Pondicherry are Gingee 30.215 km., the Pambayar 11.50 km the Gudavayar 13.50 km the Malatar 25.50 km and the Penniar 14.00 km.

In Karaikal the Nandalar 15.165 km , the Nattar 12.60 km., Vanjiar 12.30 km , the Noolar 14 km , the Arasalar 11.76 km , the Thirumalai Arasalar 10.55 km , and the Pravadayanar 5.60 km. are the rivers.

In Mahe, the Mahe river 114.4 km runs 1 km, of its course in the Territory.

In Yanam, the Goringa 15.24 km, runs for 4.00 km, and the Godavary runs for 8 km length in the territory.

History. Pondicherry entered modern history when the French East India Company established a settlement there in 1673. The French converted this obscure little village into a flourishing trading centre. French was the last European power to come to India for trade. The Dutch and the English had already established themselves at various centres in India. The Portuguese who came first were by this time a spent force. It was quite natural that rivalries should arise among the later powers for dominance in India. Actually what brought them ito conflict in India was the rivalry at home, that is, in Europe. The Dutch were the first to cross swords with France. They captured Pondicherry in 1693 but returned it to France under the Treaty of Ryswick in 1697. Pondicherry regained its prosperity in a few years. In 1706 Pondicherry had a population of 40,000 while the English town of Calcutta had barely 22,000.

In the meantime, the French East India Company had run into financial difficulties and the company was forced to abandon their trading posts in Bantam, Surat and Masulipatnam. In 1720 the Company was reconstituted as the "Perpetual Company of the Indies" and new French establishments sprang up in the East. Mauritius was occupied in 1721, Mahe on the Malabar Coast soon after, Yanam in 1731 and Karaikal in 1738. With the appointment of Dupleix as Governor of Pondicherry in 1742. France became involved in Indian politics. Duplex harboured ambitions of establishing a French Empire in India.

When the Austrian Succession War (1740–48) broke out in Europe, England and France took opposite sides. Anglo-French hostility spread of India. The English captured some French ships. Dupleix reacted sharply. He captured Madras in 1748. The Austrian War of Succession was ended by the Treaty of Aix-La-Chappelle and Madras was returned to the English. Fresh hostilities, however, borke out between the English and the French in India. Pondicherry changed hands according to the fortunes of the Anglo-French wars. The English captured Pondicherry in 1761, returned it in 1765, retook it in 1778, captured it a third time in 1793 and finally restored it to France in 1814.

When at last British paramountcy was established in India. Pondicherry ceased to be of any political importance and the British let the French continue in their possessions in India. The French Government handed over the administration of their territories in India to the independent Government of India in November, 1954. The territories thus handed over were constituted into the Union Territory of Pondicherry.

Administration. Pondicherry is administered by the President of India throug a Lt. Governor who is advised by the Council of Ministers which is responsibl to the Legislative Assembly, consistin of 30 members. Normally the Council o Ministers under a Chief Minister carrie on the administration directly.

The territory is divided into fou regions — Pondicherry, Karaikal, Mah and Yanam — which are geographicall far removed from one another. Of th four regions only two, Pondicherry an Karaikal, have any mentionable size.

Table 264

Districts	Area in '000 (sq. km)	Populatio
Pondicherry	0.29	444,1
Karaikal	0.16	119,9
Mahe	0.01	28.4
Yanam	0.03	11,6

Agriculture. The Union Territory of Pondicherry consists of four non-contiguous settlements, viz., Pondicherry, Karaikal, Mahe and Yanam. The first three are on the sea coast and the fourth region is in the East Godavari delta. There are no forests or mountains.

Nearly 45% of the population is engaged in agriculture and allied pursuits, 89% of the cultivated area is irrigated. Rice is the main food crop. Other crops grown in small quantities are ragi and bajra. Sugarcane, groundnut and cotton are the principal cash crops.

Though the Agriculture Department, has drawn up an ambitious programme to achieve a targetted food grain production of 1,20,000 M.T. during 1980−81, the situation that has arisen due to the failure of the monsoon has affected the food grains production. In addition to foodgrain, short fall was noticed in production of sugarcane and cotton. In general, this year was bad to agriculture.

Table 265

Area and Production of Main Crops

Name of the crop	*Area in hectares*	*Production in M.T.*
1. Food grains		
a) Rice	28,515	67,000
b) Millets	4,400	15,000
c) Pulses	8,150	3,000
2. Sugarcane	1,900	1,70,000
3. Groundnut (pods)	5,700	11,500
4. Cotton	1,150	4,450

Table 266

Animal Husbandry

1. Cattle	91,596
2. Buffaloes	9,986
3. Sheep	4,603
4. Goats	39,258
5. Horses and ponies	42
6. Donkeys	262
7. Pigs	2,362
8. Total livestock	1,48,109
9. Total poultry	1,48,229

Fisheries. The Union Territory of Pondicherry comprising Pondicherry, Karaikal, Yanam and Mahe has a total coastline of 45 km and consists of 28 marine fishing villages. Marine fish production for the year 1980 was around 14000 M.T. The important varieties of fish caught in 1980 were elasmobranchs, cat fish, sciaenids, clupeiods, mackerels, oil sardines, other sardines, perches, cybium, pomfret, soles and panaeid prawns. With limited inland resources, the total *inland fish* production is nearly 1600 M.T.

Irrigation. Irrigation in Pondicherry is mainly through rain-fed tanks. There are about 87 tanks of which two are comparatively big. In Karaikal the irrigation system depends on the Cauvery water. The entire network of canals etc., is very old and has to be modernised to suit present day requirements and conditions. Accordingly, many modernisation schemes have been taken up and are in progress. Much attention is paid to design programmes, so that benefits out of major schemes are carried to the 15 ha. level.

Electricity. At present there is no generation of power in this Union Territory of Pondicherry. The entire power requirement is being purchased from Tamil Nadu, Kerala and Andhra Pradesh State Electricity Boards.

All the villages in this Union Territory of Pondicherry were electrified by the end of the financial year 1971−72, thus achieving a cent percent rural electrification a decade age. The demand for power in Pondicherry is increasing steadily. To meet this growing demand, additional Extra High Tension (EHT) sub-stations are being installed in Pondicherry and Karaikal region.

The consumption of energy was 179.9 million units for the year 1980−81 with a peak demand of 40.30 Megawatts.

Industry. There are no heavy industries or mining in the Territory. Most of the industries are medium units and primarily consumer oriented like sugar, electrical appliances, leather goods, cycle parts, handloom cloth and handicrafts. The Territory has a few large scale units in cotton textiles and in paper and boards. The Pondicherry Papers Ltd., with its registered office and works situated at Billiarkuppan Bahour Commune, Pondicherry is the biggest unit in paper and boards in the Territory. Three medium units for manufacture of Rive-bran oil have commenced production in this Territory recently.

Roads. Priority is being given to linking all the villages in the Territory with all-weather roads. Accordingly much attention is being paid to the formation/laying of rural roads. It is expected that by the end of VI Plan all the villages will be linked with all-weather roads.

Water Supply. In the urban areas improvement works and augmentation of the water supply had been extensively done in the past. The VI Plan aims at covering all villages with protected drinking water supply before the end of the plan. New water supply programmes are therefore being taken up in rural areas. 60% of the villages have been provided with the basic amenity.

Education

Table 267

Educational Institutions in 1981-82

Type of Instn.	No. of Instns.	No. of students	No. of teachers
Schools:			
Pre-primary School	71	4519	99
Primary School	279	32778	1019
Middle School	97	39001	1345
High School	59	37097	1566
Higher Secondary	17	15398	733
Colleges:			
Colleges (General)	9	5822	494
Medical College	1	445	119
Law College	1	230	12
Professional & Technical:			
Polytechnic	1	457	51
Technical Hr. Sec. School	1	204	17
Nursing School	1	96	18
School of Embroidery and Needlework	1	271	16
Pre-Vocational Trg. Centres	4	338	26
School for the Blind, Deaf and Dumb	2	65	5

Table 268

Health and Family Welfare Medical Facilities 1981

No. of Hospitals	10 (Govt. 8+Pvt. 2)
General Hospitals	4
Maternity Hospital	1
T.B. Sanatorium	1
Leprosy Hospital	1
ESI Hospital	1
Private Maternity Hospital	1
Private Nursing Home	1
Dispensaries	28
ESI Dispensaries (including 1 part-time ESI Disp)	7
Primary Health Centres	12
Chest Clinic	1
T.B. Wards attached to Gen. Hospital	2
Filaria Control Units	2
Leprosy Control Unit	1
Sub-Centres	44
No. of beds	1522
No. of Doctors	242
No. of Nurses	385
Bed population ratio	1:250
Doctor population ratio	1:1350
Leprosy S.E.T. Centres	26
Medical Depots	19
Ayurvedic Clinics	6
Siddha Clinics	4
Cholera Control Unit	1
Smallpox Control Unit	1
Drug Control Unit	1
Mobile Dental Clinic	1
Public Health Laboratory	1

Box 64

Per Capita Income of States

The Union Territory of Goa, Daman and Diu has recorded the highest per capita net income among the States and Union Territories in the country, with its figure touching 2,426 in 1980 as against the all-India national income figure of 1,379.

The tiny territory has beaten prosperous Maharashtra State into third place with its per capita figure at 1,903.

The agriculturally affluent Punjab has won the second place with its per capita income figure touching 2,278.

But Gujarat, which has taken the fourth place, with per capita income figure at 1,623 has brought into focus the pre-eminent prosperity of the western peninsula along the Arabian Sea.

Of the 23 States and Union Territories, figures for which are officially available, Manipur occupies the lowest place with per capita figure at 822. Next comes Madhya Pradesh with 828, Meghalaya 843 and Rajasthan 913.

The other positions are: Andhra Pradesh 1,176, Assam 960, Haryana, Jammu and Kashmir, Karnataka 1,267, Tamil Nadu 1,350, U.P. 981 and West Bengal 1,330.

The Statesman, New Delhi.

PART IV

SPORTS AND GAMES

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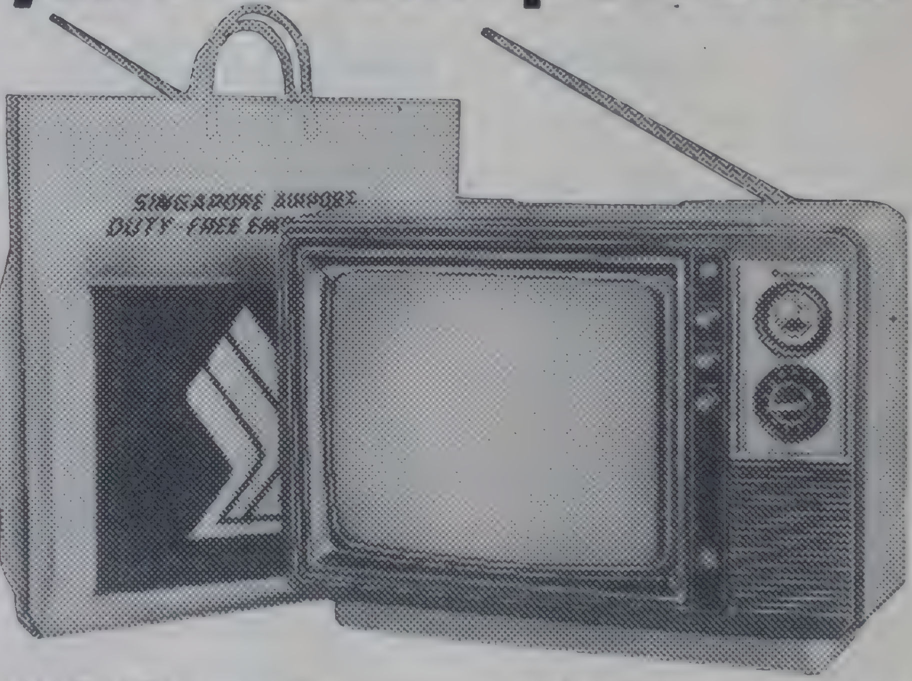

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189. SPORTING WORLD 1982

Note: As this Year Book is released in the middle of the sporting season, it has been hard for us to maintain a temporal continuity. In order to provide the readers with a ready reference for sports events on an annual basis, we are giving below a chronological review of the major sports events of the past year (1982). Some of these events will be dealt with in detail in the reports that follow.

January

6. The fourth Test between England and India ends in a draw at Calcutta. The second Test between West Indies and Australia ends in a draw at Sydney.

7. India loses to Australia and fails to qualify for the World Cup hockey semifinal at Bombay.

12. Pakistan wins World Cup hockey tournament at Bombay defeating Germany.

19 The fifth Test between England and India ends in a draw at Madras.

Syed Modi and Madhumita win National badminton singles titles at Udyogamandal.

Ivan Lendl wins Grand Prix Masters title at New York (tennis).

31. Girish Parekh wins National snooker title at Madras.

Bengal regains Santosh trophy in the National football championship defeating Railways 2–0 at Trichur.

February

2. Geet Sethi becomes the youngest Indian to win the National billiards crown at Madras.

3. West Indies beats Austrialia in the third and final cricket Test at Adelaide to draw the three match series 1–1.

4. The final Test at Kanpur ends in a draw and India wins the rubber 1–0 against England in the cricket series.

5. England wins men's and women's titles at the Commonwealth table tennis championships at Bombay.

9. Nigerian Atanda Musa wins double crown in the Commonwealth table tennis championships at Bombay.

13. Punjab retains National hockey championship beating Airlines at Calcutta.

21. Sri Lanka loses its first ever official cricket Test match to England at Colombo.

March

1. Pravin Thipsay claims National chess title at Kanpur

Services (men), Punjab (women) win National basketball titles at Ludhiana.

4. Uruguay beats China to win the inaugural Jawaharlal Nehru international football tournament at Calcutta.

7. U.S. trounces India in the Davis Cup tennis championship.

14. Sashi Menon and Namrata Appa Rao claim National tennis titles at Bombay.

21. Hsu Sheng-san of Taiwan wins Indian open golf championship at Calcutta.

29. Delhi defeats Karnataka to win the Ranji trophy at New Delhi.

May

2. Mohun Bagan retains Federation Cup (football) beating Mafatlal in the final at Calicut.

16. Railways retains National women's hockey title at Calicut.

June

6. Swede Mats Wilander becomes the youngest player to win the men's singles title of the French Open tennis champsionships.

13. Holland wins Champions trophy hockey tournament at Amsterdam.

Belgium shocks holder Argentina in the opening match of the World Cup football tournament in Spain.

15. England beats India in the first cricket Test at London.

July

4. Jimmy Connors regains men's singles title at the Wimbledon championship defeating holder John McEnroe.

11. Italy beats West Germany to win the World Cup soccer championship.

13. The Oval Test between England and India ends in a draw, confirming England's series win.

14. Ramesh Krishnan wins Stuggart Grand Prix tennis tournament

August

1. England beats Pakistan in the first cricket Test at Birmingham.

15. Indonesian Luis Pongoh wins Indian Masters badminton championship at Hyderabad

16. Pakistan gets even with England with victory in the second cricket Test in London

23. The Brazilian selection humbles Ghana to win the Merdeka football tournament at Kuala Lumpur

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SGS KEPL/8/81

28. West Germany wins junior World Cup hockey tournament at Kuala Lumpur.

31. England clinches cricket series against Pakistan with victory at Leeds.

September

12. Prakash Padukone wins Hong Kong open badminton championship.

13. Jimmy Connors wins U.S. open tennis title at New York.

23. Sri Lanka draws Test match with India at Madras.

27. Pakistan beats Australia in the first cricket Test at Karachi.

30. The XII Commonwealth Games opens at Brisbane.

October

3. Australia and England dominate the show in the Commonwealth Games.

4. Alex Bauman of Canada sets new world mark in 200 metres individual medley in swimming at the Commonwealth Games.

5. Pakistan beats Australia by an innings to take a winning 2—0 lead in the cricket series at Faisalabad.

6. Scot Allan Wells claims sprint double in the Commonwealth Games.

7. Indian wrestlers put up grand show in the Commonwealth Games winning four gold medals. Syed Modi retains badminton gold for India.

8. The Commonwealth Games ends with Australia claiming the maximum gold medals.

17. North Zone wins Duleep trophy cricket tournament beating West in the final at Bombay.

19. Pakistan makes a clean sweep by winning the third Test at Lahore for a 3—0 record against Australia in cricket.

24. Rest of India pulls off remarkable victory over Delhi in the Irani trophy cricket final.

30. Prakash Padukone loses to Marten Frost Hansen in the Scandinavian Cup badminton tournament final.

November

5. Jayant Shah of Kenya wins the third Himalayan motor rally.

7. West Zone wins Deodhar trophy cricket tournament beating North.

16. The Soviet Union wins the '82 Chess Olympiad.

19. The ninth Asian Games is inaugurated at Delhi.

20. India records victories in football and hockey in the Asiad.

21. Japanese corner glory in Asiad swimming, the Chinese in gymnastics.

22. Chinese win both team titles in table tennis in the Asiad.

23. Chinese wizardy supreme in gymnastics at the Asiad.

Ragubir Singh leads India to gold medal triumph in equestrian events.

24. Golfers get India two golds at the Asiad.

Koreans dominate shooting event.

25. Takashaki of Japan soars to record height in pole vault, Chand Ram and Bahadur Singh earn india gold on the first day of the Asiad athletics programme.

China, led by Xie Saike, dominates the open events, too, in table tennis.

26. Charles Barromeo blazes a golden trail for India on the track, the Indian girls in field hockey and Japan dominates cycling in the Asiad.

27. The day belongs to india's Valsamma in the athletics and the South Korean girl Youn Hee in the pool in the Asiad.

28. Japanese hammer specialist Murofushi stalks Asiad stage as China comes up trumps in badminton in the Asian Games.

At Grenoble, France, the US wraps up its Davis Cup final tie against the host with an impeccable display from McEnroe.

30. China's Zhou Zhen Xian sets a new triple jump mark as the Chinese stand ahead in the overall medals tally.

December

1. Pakistan humbles India to win hockey gold in the Asian Games. China's Zhu Jianhua leaps to record height in high jump. Tarik (Indonesia) and Inoue (Japan) win men's and women's singles in tennis. Australia beats England in the second cricket Test at Brisbane.

2. Japan's Hiromi Izosaki proves the golden girl in athletics.

3. Pakistan wins first one day international against India at Gujranwala.

4. The curtain goes down on the Asian Games at Delhi.

11. India gains revenge, beating Pakistan in the Esanda hockey tournament at Melbourne.

15. Australia takes a 2—0 lead over England in the Ashes series with its victory at Adelaide. India draws first Test with Pakistan at Lahore.

17. India loses second one day international to Pakistan in cricket

19. Australia pounds India into submission in the Esanda hockey tournament final

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190. XXII OLYMPIAD — MOSCOW (23rd

ATHLETICS

July—August 1980

The 22nd Summer Olympics was held in Moscow in July—August 1980.

1980 Summer Olympics. Of the 142 National Olympic Committees 81 participated in Moscow Olympics (1980) in one way or another. USA, West Germany, Japan and other major sporting countries boycotted the Games protesting against the intervention of Soviet Union in Afghanistan.

Pre-1980 Olympiads. In the eighty years beginning from 1896 at Athens and ending in 1980 at Moscow we have had 22 Olympiads, three of which could not be held owing to the two World Wars. The 6th Olympiad at Berlin for 1916 had to be cancelled because the First World War had broken out. The 12th for 1940 and the 13th for 1944 could not also be held as the Second World War was on. In the result, out of the 21 Olympiads that should have taken place, we have staged only 18.

The term **Olympiad** is to be distinguished from the **Olympics.** Olympics is merely an abbreviation for Olympic Games. The Olympiad implies not only the Games but also a period of time. It is, in other words, more a reference point of time than a term signifying the Games. The year of the *First* Olympiad would be, for us, the year 1896 when the first modern Olympics started at Athens. The third year of the **First** Olympiad would be in the year 1899 and the first year of the **Second** Olympiad would be the year 1900, while the 80th year of the Olympiad would be the year 1976.

The distinction is of academic interest only and not of any practical importance because our calendars are calculated on other bases.

Sites and Dates of Modern Olympiads Modern Olympiads, unlike the Greek Olympiads, are not confined to one place. They change the venue every time. The dates and sites of the SUMMER Olympics are given below.

I	Athens, Greece	1896	April 6—15
II	Paris, France	1900	May 20—Sept. 20
III	St. Louis, Missouri, U.S.	1904	July 1—Nov. 23
IV	London, England	1908	April 27—Oct. 31
V	Stockholm, Sweden	1912	May 5—July 22
VI	Berlin, Germany	1916	Cancelled because of World War I.
VII	Antwerp, Belgium	1920	April 20—Sept. 12
VIII	Paris, France	1924	May 4—July 27
IX	Amsterdam, Holland	1928	May 17—Aug. 12
X	Los Angeles, Calif. U.S.	1932	July 31—Aug. 14
XI	Berlin, Germany	1936	Aug. 1—Aug. 16
XII	Not held*		
XIII	Not held‡		
XIV	London, England	1948	July 29—Aug. 14
XV	Helsinki, Finland	1952	July 19—Aug. 3
XVI	Melbourne, Australia†	1956	Nov. 22—Dec. 8
XVII	Rome, Italy	1960	Aug. 25—Sept. 11
XVIII	Tokyo, Japan	1964	Oct. 12—Oct. 24
XIX	Mexico city, Mexico	1968	Oct. 12—Oct. 27
XX	Munich, W. Germany	1972	Aug. 26—Sept. 11
XXI	Montreal, Canada	1976	July 17—Aug. 1

Olympic Honours—1980. The Soviet Union just missed a double century of Medals in the 22nd Olympiad. They amassed 196 medals—80 Gold, 69 Silver and 47 bronze breaking the record of 125 they had set at Montreal 4 years before

East Germany retaind second spot with a total of 126 medals. India finished 31st with one gold. Although India and

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* Originally programmed for London. Abandoned because of World War II.

‡ First programmed for Tokyo, then Helsinki and finally abandoned on account of World War II.

† Equestrian events were held in Sweden between June 10 and 17, owing to quarantine rules about horses in Australia.

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Belgium had the same number of gold, Belgium was ranked 30th because it won a gold earlier in the games in an individual event.

Final Medal Tally

	Gold	*Silver*	*Bronze*
Soviet Union	80	69	47
East Germany	47	36	43
Bulgaria	8	16	16
Cuba	8	7	5
Italy	8	3	4
Hungary	7	10	15
Romania	6	6	13
France	6	5	3
Britain	5	7	9
Sweden	3	3	6
Finland	3	1	4
Brazil	3	—	2
Poland	3	15	14
Czechoslovakia	2	4	8
Yugoslavia	2	3	4
Australia	2	2	5
Denmark	2	1	2
Ethiopia	2	—	2
Switzerland	2	—	—
Austria	1	2	1
Greece	1	—	2
Belgium	1	—	—
India	1	—	—
Zimbabwe	1	—	—

OLYMPIC RESULTS

TRACK AND FIELD

Women

100 m: 1. L. Kondratyeva (USSR) 11.06, 2 M. Gohr (GDR) 11.07, 3. I. Auerswald (GDR) 11.14.

200 m: 1. B. Wockel (GDR) 22.03 (OR), 2. N. Bochina (USSR) 22.19, 3. M. Ottey (Jamaica) 22.20.

400 m: 1. M. Koch (GDR) 48.88 (OR), 2. J. Kratochvilova (Czechoslovakia) 49.46, 3. C. Lathan (GDR) 49.66.

800 m: 1. N. Olizarenko (USSR) 1:53.5 (WR), 2. O. Mineyeva (USSR) 1:54.9, 3. T. Providokhina (USSR) 1:55.5.

1500 m 1. T. Kazankina (USSR) 3:56.6 (OR), 2. C. Wartenberg (GDR) 3:57.8, 3 N. Olizarenko (USSR) 3:59.6.

Relay 4×100 m: 1. GDR 41.60 (WR), 2. USSR 42.10, 3. Great Britain 42.43.

Relay 4×400 m: 1. USSR 3:20.2, 2. GDR 3:20.4, 3. Great Britain 3:27.5.

100 m.hurdels: 1. V. Komisova (USSR) 12.56 (OR), 2. J. Klier (GDR) 12.63, 3 L. Langer (Poland) 12.65.

High jump: 1. S. Simeoni (Italy) 197 (OR), 2. Kielan (Poland) 194, 3. J. Kirst (GDR) 194

Long jump: 1. T. Kolpakova (USSR) 706 (OR), 2. B. Wujak (GDR) 704, 3. T. Skachko (USSR) 701.

Shot putt: 1. I. Slupianek (GDR) 22.41 (WR), 2. S. Krachevskaya (USSR) 21 42, 3 M Pufe (GDR) 21.20

Discus throwing: 1. E Jahl (GDR) 69 96 (OR), 2. M Petkova (Bulgaria) 67.90, 3 T Lesovaya (USSR) 67 40.

Javelin throwing: 1. M. Colon (Cuba) 68 40 (OR), 2. S. Gunba (USSR) 67.76, 3. U. Hommola (GDR) 66.56

Pentathlon: 1. N. Tkachenko (USSR) 5083 pts (WR), 2 O. Rukavishnikova (USSR) 4937, 3. O. Kuragina (USSR) 4875

WR—World record
OR—Olympic record
ER—European record

Men

100 m: 1. A. Wells (Great Britain) 10.25 2 S Leonard (Cuba) 10.25, 3 P. Petrov (Bulgaria) 10.39.

200 m: 1. P. Mennea (Italy) 20.19, 2. A. Wells (Great Britain) 20.21, 3. D. Quarrie (Jamaica) 20.29.

400 m 1 V Markin (USSR) 44 60 (ER), 2 R Mitchell (Australia) 44.84, 3. F. Schaffer (GDR) 44.87.

800 m 1 S. Ovett (Great Britain) 1:45.4, 2 S. Coe (Great Britain) 1:45.9, 3. N. Kirov (USSR) 1:46.0

1500 m. 1. S Coe (Great Britain) 3:38.4, 2 J. Straub (GDR) 3:38.8, 3. S. Ovett (Great Britain) 3.39.0.

5000 m: 1. M. Yifter (Ethipia) 13:21.0, 2. S. Nyambui (Tanzania) 13:21.6, 3 K Maaninka (Finland) 13:22.0

10,000 m: 1. M. Yifter (Ethiopia) 27:42.7 2 K Maaninka (Finland) 27:44.3, 3. M Kedir (Ethiopia) 27:44.7.

Marathon: 1. W. Cierpinski (GDR) 2:11.030.0, 2. G. Nijboer (Netherlands) 2.11.20.0, 3. S. Dzhumanazarov (USSR) 2:11.35 0

Relay 4×100 m: 1. USSR 38.26, 2 Poland 38 33, 3 France 38.53

Relay 4×400 m: 1. USSR 3:01.1, 2. GDR 3 01.3, 3. Italy 3 04 3.

110 m hurdles. 1. T. Munkelt (GDR) 13.39, 2 A. Casanas (Cuba) 13 40, 3. A Puchkov (USSR) 13 44

400 m hurdles 1. V Beck (GDR) 48.70, 2 V. Arkhipenko (USSR) 48.86, 3. G Oakes (Great Britain) 49.11

3000 m steeplechase 1. B Marinowski (Poland) 8 9.7, 2 F. Bayi (Tanzania) 8:12.5, 3 E. Tura (Ethiopia) 8.13 6

20 km walk: 1. M. Damilano (Italy) 1:23.35.5 (OR), 2. P. Pochinchuk (USSR) 1.24 45 4, 3. R Wieser (GDR) 1.25 58 2

50 km walk 1 H Gauder (GDR) 3 49 24 0 (OR), 2. J. Llopart (Spain) 3.51.25 0, 3 E. Ivchenko (USSR) 3:56 32 0

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High jump: 1. G. Wessig (GDR) 236 (WR), 2. J. Wszola (Poland) 231, 3. J. Freimuth (GDR) 231.

Long jump: 1. L. Dombrowski (GDR) 854 (ER), 2 F Paschek (GDR) 821, 3 V. Podluzhny (USSR) 818.

Pole vault: 1. W. Kozakiewicz (Poland) 578 (WR), 2. K. Volkov (USSR) and T. Slusarski (Poland) 565.

Triple jump: 1. Ya. Uudmyae (USSR) 17.35, 2. V. Saneyev (USSR) 17.24, 3. J.C. de Oliveira (Brazil) 17,22.

Shot Putt: 1. V. Kiselyov (USSR) 21.35 (OR), 2. A. Baryshnikov (USSR) 21.08, 3. U. Beyer (GDR) 21.06.

Discus: 1. V. Rashchupkin (USSR) 66.64, 2. I. Bugar (Czechoslovakia) 66.38, 3. L. Delis (Cuba) 66.32.

Hammer: 1. Yu. Sedykh (USSR) 81.80 (WR), 2. S. Litvinov (USSR) 80.66, 3. Yu. Tamm (USSR) 78.96.

Javelin: 1. D. Kula (USSR) 91.20, 2. A Makarov (USSR) 89.64, 3. W. Hanisch (GDR) 86.72.

Decathlon: 1. D. Thompson (Great Britain) 8495, 2. Yu. Kutsenko (USSR) 8331, 3. S. Zhelanov (USSR) 8135.

SWIMMING

Women

100 m freestyle: 1. B. Krause (GDR) 54 98 sec (WR), 2. C. Metschuck (GDR) 55.16, 3. I. Diers (GDR) 55.65.

200 m. freestyle: 1. B. Krause (GDR) 1 m 58.33 sec (OR), 2. I. Diers (GDR) 1:59.64, 3. C. Schmitt (GDR) 2:01.44.

400 m freestyle: 1. I. Diers (GDR) 4 m 08.76 sec (OR), 2. P. Schneider (GDR) 4:09 16, 3 C. Schmitt (GDR) 4:10.86.

800 m freestyle: 1. M. Ford (Australia) 8 m 28 90 sec (OR), 2. I. Diers (GDR) 8:32.55, 3. H. Dahne (GDR) 8:33.48.

100 m breaststroke: 1. U. Geweniger (GDR) 1m 10.22 sec (preliminary heat 1 10 11 [WR], 2. E. Vasilkova (USSR) 1:10.41, 3. S. Nielsson (Denmark) 1 11 16

200 m breaststroke: 1. L. Kaciusyte (USSR) 2m 29.54 sec (OR), 2. S. Varganova (USSR) 2:29.61, 3. Yu. Bogdanova (USSR) 2:32.39.

100 m butterfly: 1. C. Metschuck (GDR) 1m 00.42 sec, 2. A. Pollack (GDR) 1:00 90, 3 C. Knacke (GDR) 1:01.44

200 m butterfly: 1. I. Geissler (GDR) 2m 10.44 sec (OR), 2. S. Schonrock (GDR) 2:10.45, 3. M. Ford (Australia) 2:11.66

100 m backstroke: 1. R. Reinisch (GDR) 1m 00 86 sec (WR), 2. I. Kleber (GDR) 1:02.07, 3. P. Riedel (GDR) 1.02 64

200 m backstroke: 1. R. Reinisch (GDR) 2m 11 77 sec (WR), 2. C. Polit (GDR) 2:13.75, 3. B. Treiber (GDR) 2:14 14

400 m individual medley: 1. P. Schneider (GDR) 4m 36.29 sec (WR), 2. S. Davies (Great Britain) 4:46.83, 3. A. Czopek (Poland) 4:48.17.

4×100 m freestyle relay: 1. GDR 3 m 42.71 sec (WR), 2. Sweden 3:48.93, 3. Netherlands 3:49.51.

4×100 m medley: 1. GDR 4m 06.67 sec (OR), 2. Great Britain 4:12.24, 3. USSR 4:13.61.

Men

100 m freestyle: 1. J. Woithe (GDR) 50.40 sec (ER), 2. P. Holmertz (Sweden), 50.91, 3. P. Johansson (Sweden) 51.29.

200 m freestyle: 1. S. Koplyakov (USSR) 1m 49.81 sec (OR), 2. A. Krylov (USSR) 1:50.76, 3. G. Brewer (Australia) 1:51.60.

400 m freestyle: 1. V. Salnikov (USSR) 3 m 51.31 sec (OR), 2. A. Krylov (USSR) 3:53.24, 3. I. Stukolkin (USSR) 3:53.95.

1500 m freestyle: 1. V. Salnikov (USSR) 14m 58.27 sec (WR), 2. A. Chayev (USSR) 15:14.30, 3. M. Metzker (Australia) 15:14.59.

100 m breaststroke: 1. D. Goodhew (Great Britain) 1m 03.34 sec, 2. A. Miskarov (USSR) 1:03.82, 3. P. Evans (Australia) 1:03.96.

200 m breaststroke: 1. R. Zhulpa (USSR) 2m 15.85 sec, 2. A. Vermes (Hungary) 2:16.93, 3. A. Miskarov (USSR) 2:17.28.

100 m butterfly: 1. P. Arvidsson (Sweden) 54.92 sec, 2. R. Pyttel (GDR) 56.94, 3. D. Lopez (Spain) 55.13.

200 m butterfly: 1. S. Fesenko (USSR) 1 m 59.76 sec, 2. Ph. Hubble (Great Britain) 2:01.20, 3. R. Pyttel (GDR) 2:01.39.

100 m backstroke: 1. B. Baron (Sweden) 56.53 sec, 2. V. Kuznetsov (USSR) 56.99, 3. V. Dolgov (USSR) 57.63.

200 m backstroke: 1. Z. Wladar (Hungary) 2m 01.93 sec, 2. Z. Verraszto (Hungary) 2:02.40, 3. M. Kerry (Australia) 2:03.14

400 m individual medley: 1. A. Sidorenko (USSR) 4m 22.89 sec (OR), 2. S. Fesenko (USSR) 4:23.43, 3. Z Verraszto (Hungary) 4:24.24

4×200 m freestyle relay: 1. USSR 7m 23 50 sec (ER), 2. GDR 7:28.60, 3 Brazil 7:29.30

4×100 m medley: 1. Australia 3 m 45.70 sec, 2. USSR 3.45.92, 3 Great Britain 3 47.71

GYMNASTICS

Team (men). 1. USSR 586.6 pts, 2. GDR 581.15 pts, 3. Hungary 575.0 pts

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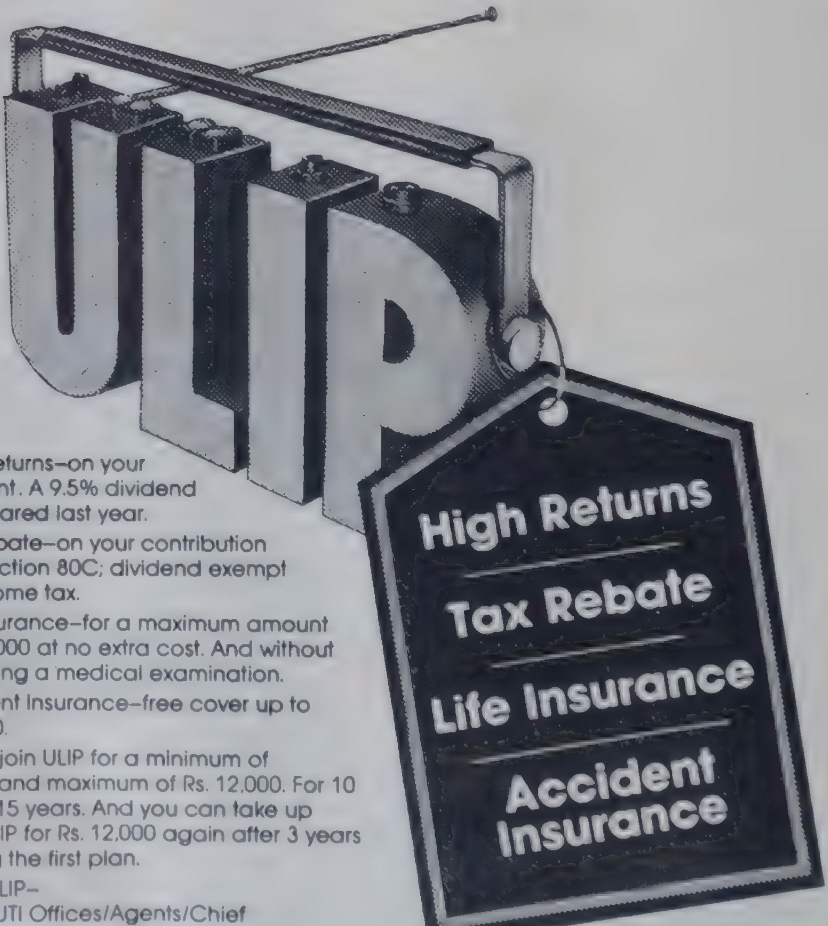

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Shilpi UTI 3/82

Team (women): 1. USSR 394.6 pts, 2. Romania 393.5 pts, 3. GDR 392.55 pts.

Overall (men): 1. A. Dityatin (USSR) 118.650 pts, 2. N. Andrianov (USSR) 118.225 pts, 3. S. Delchev (Bulgaria) 118.000 pts.

Overall (women): 1. Ye. Davydova (USSR) 79.150 pts, 2-3. M. Gnauck (GDR) and N. Comaneci (Romania) 79.075 pts.

Floor exercises: 1. R. Bruckner (GDR), 2. N. Andrianov, 3. A. Dityatin.

Side horse: 1. Z. Magyar (Hungary), 2. A. Dityatin, 3. M. Nikolay (GDR).

Rings: 1. A. Dityatin, 2. A. Tkachov, (USSR), 3. J. Tabak (Czechoslovakia).

Vault: 1. N. Andrianov, 2. A. Dityatin, 3. R. Bruckner.

Parallel bars: 1. A. Tkachov, 2. A. Dityatin, 3. R. Bruckner.

Horizontal bar: 1. S. Delchev, 2. A. Dityatin, 3. N. Andrianov.

Women

Vault: 1. N. Shaposhnikova (USSR), 2. S. Kraker (GDR), 3. M. Ruhn (Romania).

Uneven bars: 1. M. Gnauck, 2. E. Eberle (Romania), 3. S. Kraker, M. Ruhn and M. Filatova (USSR).

Beam: 1. N. Comaneci, 2. Ye. Davydova, 3. N. Shaposhnikova.

Floor exercises: 1. N. Comaneci and N. Kim (USSR), 2-3. N. Shaposhnikova (USSR) and M. Gnauck (GDR).

WEIGHTLIFTING

52 kg: 1. K. Osmonoliyev (USSR) 245 kg(OR), 2. Bong-Chol Kho (DPRK) 245, 3. Giong-Si Khan (DPRK) 245.

56 kg: 1. D. Nunez (Cuba) 275 kg. (WR), 2. Yu Sarkisyan (USSR) 270, 3. T. Dembonczyk (Poland) 265.

60 kg: 1. V. Mazin (USSR) 290 kg. (OR), 2. S. Dimitrov (Bulgaria) 287.5, 3. M. Seweryan (Poland) 282.5.

67.5 kg: 1. Ya. Rusev (Bulgaria) 342.5 kg (WR), 2. J. Kunz (GDR) 335, 3. M. Pachov (Bulgaria) 325.

75 kg: 1. A. Zlatev (Bulgaria) 360 kg (WR), 2. A. Perviy (USSR) 357.5, 3. N. Kolev (Bulgaria) 345.

82.5 kg: 1. Yu. Vardanyan (USSR) 400 kg. (WR), 2. B. Blagoyev (Bulgaria) 372.5, 3. D. Poliacik (Czechoslovakia) 367.5.

90 kg: 1. P. Baczako (Hungary) 377.5 kg., 2. P. Alexandrov (Bulgaria) 375, 3. F. Mantek (GDR) 370.

100 kg: 1. O. Zaremba (Czechoslovakia) 395 kg (OR), 2. I. Nikitin (USSR) 392.5, 3. A. Blanco (Cuba) 385.

110 kg: 1. L. Taranenko (USSR) 422.5 kg (WR), 2. V. Khristov (Bulgaria) 405, 3. G. Szalai (Hungary) 390.

Over 110 kg: 1. S. Rakhmanov (USSR) 440 kg., 2. J. Heuser (GDR) 410, 3. T. Rutkowski (Poland) 407.5.

FREESTYLE WRESTLING

48 kg: 1. C. Pollio (Italy), 2. Shang Se-Khong (DPRK), 3. S. Kornilayev (USSR).

52 kg: 1. A. Beloglazov (USSR), 2. W. Stecyk (Poland), 3. N. Selimov (Bulgaria).

57 kg: 1. S. Beloglazov (USSR), 2. Kho-Pkhiong Li (DPRK), 3. O. Dugarsuren (Mongolia).

62 kg: 1. M. Abushev (USSR), 2. M. Dukov (Bulgaria), 3. G. Hadjiioannidis (Greece).

68 kg: 1. S. Absaidov (USSR), 2. I. Yankov (Bulgaria), 3. S. Sejdi (Yugoslavia).

74 kg: 1. V. Raichev (Bulgaria), 2. Zh. Davaazhav (Mongolia), 3. D. Karabin (Czechoslovakia).

82 kg: 1. I. Abilov (Bulgaria), 2. M. Aratsilov (USSR), 3. I. Kovacs (Hungary).

90 kg: 1. S. Oganesyan (USSR), 2. U. Neupert (GDR), 3. A. Cichon (Poland).

100 kg: 1. I. Mate (USSR), 2. S. Chervenkov (Bulgaria), 3. J. Strnisko (Czechoslovakia).

Over 100 kg: 1. S. Andiyev (USSR), 2. J. Balla (Hungary), 3. A. Sandurski (Poland).

GRAECO-ROMAN

48 kg: 1. Zh. Ushkempirov (USSR), 2. C. Alexandru (Romania), 3. F. Seres (Hungary).

52 kg: 1. V. Blagidze (USSR), 2. L. Racz (Hungary), 3. M. Mladenov (Bulgaria).

57 kg: 1. Sh. Serikov (USSR), 2. J. Lipien (Poland), 3. B. Ljungbeck (Sweden).

62 kg: 1. S. Migiakis (Greece), 2. I. Toth (Hungary), B. Kramarenko (USSR).

68 kg: 1. S. Rusu (Romania), 2. A. Supron (Poland), 3. L. E. Skiold (Sweden).

74 kg: 1. F. Kocsis (Hungary), 2. M Huhtala (Finland), 3 A Bykov (USSR)

82 kg: 1. G. Korban (USSR), 2. J. Dolgowicz (Poland), 3. P. Pavlov (Bulgaria).

90 kg: 1. N. Nottny (Hungary), 2. I Kanygin (USSR), 3. P. Dicu (Romania)

100 kg: 1. G. Raikov (Bulgaria), 2. R Bierla (Poland), 3. V. Andrei (Romania)

Over 100 kg: 1. A. Kolchinsky (USSR), 2. A. Tomov (Bulgaria), 3. H. Bchara (Lebanon).

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SUGUNA

CYCLING

1000 m pursuit heats: 1. L. Thoms (GDR) 1:02.955 (WR), 2. A. Panfilov (USSR) 1:04.845, 3. D. Weller (Jamaica) 1:05.241.

Sprint: 1. L. Hesslich (GDR), 2. Ya. Cahard (France), 3. S. Kopylov (USSR).

4000 m individual pursuit: 1. R. Dill-Bundi (Switzerland) 4:35.66 (WR), 2. A. Bondue (France) 4:42.96, 3. H.H. Orsted (Denmark) 4:36:54.

4000 m team pursuit: 1. USSR 4:15.68, 2. GDR 4:19.68, 3. Czechoslovakia (in the quarterfinals the USSR team showed the highest world result—4:14.62).

Road race. 101 km team race: 1. USSR 2 01 21, 2 GDR 2 02:53 19, 3 Czechoslovakia 2:02:53.90.

Individual 189 km race: 1. S. Sukhoruchenkov (USSR) 4:48:28.9, 2. C. Lang (Poland) 4:51:26.0, 3. Yu. Barinov (USSR) 4:51:26.0

SHOOTING

Free pistol, 50 m, 60 shots: 1. A. Melentyev (USSR) 581 pts (WR), 2. H. Vollmar (GDR) 568 pts, 3. L. Dyakov (Bulgaria) 565 pts.

Rapid fire pistol, 25 m, 60 shots: 1. C. Ion (Romania) 596 pts. 2. Wiefel (GDR) 596 pts, 3. G. Petrisch (Austria) 596 pts.

Small-bore rifle, 50 m, 3×40 shots: 1. V Vlasov (USSR) 1173 pts (WR), 2. B. Hartstein (GDR) 1166 pts, 3. S. Johansson (Sweden) 1165 pts

Small-bore rifle, 50 m. prone, 60 shots 1. K. Varga (Hungary) 599 pts (repetition of WR), 2. H. Heilfort (GDR) 599 pts (repetition of WR), 3. P Zaprianov (Bulgaria) 598 pts

Small-bore rifle, 50 m, 60 shots on Running Boar: 1. I. Sokolov (USSR) 589 pts (WR), 2. Th. Pfeffer (GDR) 589 pts, 3. A. Gazov (USSR) 587 pts

Olympic trench: 1. L. Giovannetti (Italy) 198 pts, 2. R. Yambulatov (USSR) 196 pts, 3. J. Damme (GDR) 196 pts

Skeet: 1. H. K. Rasmussen (Denmark) 196 pts, 2. L. J. Carlsson (Sweden) 196 pts, 3. R. Castrillo (Cuba) 196 pts

EQUESTRIAN

Three-day event, individual: 1. F. E. Roman (Italy) 108.60 penalty points, 2. A. Blinov (USSR) 120.80, 3. Yu. Salnikov (USSR) 151. 60

Three-day event, teams: 1. USSR 457 pts, 2. Italy 656.20, 3. Mexico 1172.85.

Grand Prix Dressage (teams): 1. USSR 4383 pts. 2. Bulgaria 3580, 3. Romania 3346.

Grand Prix Dressage (individual) 1. E. Theurer (Austria) 1370 pts, 2. Yu. Kovshov (USSR) 1300 pts, 3. V. Ugryumov (USSR) 1234 pts.

Grand Prix Jumping (teams): 1. USSR 20.25 penalty points, 2. Poland 56.0, 3. Mexico 59.75.

Grand Prix Jumping (individual): 1. J. Kowalczyk (Poland) 8 penalty points, 2. N. Korolkov (USSR) 9.5, 3. J. Perez Heraz (Mexico) 16.

FENCING

Men

Foil (individual): 1. V. Smirnov (USSR), 2. P. Jolyot (France), 3 Romankov (USSR).

Foil (team): 1. France, 2. USSR, 3. Poland

Epee (individual): 1. J. Harmenberg (Sweden), 2. E. Kolczonay (Hungary), 3. Ph. Riboud (France).

Epee (team): 1. France, 2. Poland. 3. USSR.

Sabre (individual): 1. V. Krovopuskov (USSR), 2. M. Burtsev (USSR), 3. I. Gedovari (Hungary).

Sabre (team): 1. USSR, 2. Italy, 3. Hungary.

Women

Foil (individual): 1. P. Trinquet (France), 2. M. Maros (Hungary), 3. Wysoczanska (Poland)

Foil (team): 1. France, 2. USSR, 3. Hungary

JUDO

60 kg: 1. J. Rey (France), 2. J. Rodriguez (Cuba), 3. A. Yemizh (USSR) and T Kincses (Hungary).

65 kg. 1. N. Solodukhin (USSR), 2. Ts Damdin (Mongolia), 3. I. Netkov (Bulgaria) and J. Pawlowski (Poland)

71 kg: 1. E. Camba (Italy), 2. N. Adams (Great Britain), 3. K.H. Lehmann (GDR) and R. Davaadalai (Mongolia)

78 kg: 1. Sh. Khabareli (USSR), 2. J Ferrer (Cuba), 3. B. Tchoullouyan (France) and H. Heinke (GDR)

86 kg: 1. J. Roethlisberger (Switzerland), 2. I. Azcuy (Cuba), 3. A. Yatskevich (USSR) and D. Ultsch (GDR).

95 kg: 1. R. Van De Walle (Belgium), 2. T. Khubuluri (USSR), 3. D. Lorenz (GDR) and H. Numan (Netherlands)

Over 95 kg: 1. A. Parisi (France), 2. D Zapryanov (Bulgaria), 3. V. Kocman (Czechoslovakia) and R. Kovacevic (Yugoslavia)

Open Category: 1. D. Lorenz (GDR), 2. A. Parisi (France), 3. A. Ozsvar (Hungary) and A. Mapp (Great Britain)

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* 4 MSC 4039	Mookambika Suprabhatham—Bombay Sisters
* 4 MSC 4054	Mookambika & Guruvaurappan Songs--Sukumari Menon
* 4 MSC 1033	Kanakadhara Stotram & Mahishasuramardhini—Bombay Sisters
* 4 MSC 4059	Babayanam—P. Leela
6 MSC 1049	Rudra, Namakam & Chamakam—Sharma & Shastry
* 6 MSC 6018	Venkateshwara Suprabhatham & Prapatti—Dr. P. B. Sreenivos

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* 4 MSC 4056	Bhakthi Gaana Maalika—P. Leela
* 4 MSC 1036	Sri Ayyappan Songs—Jaya Vijaya
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6 MSC 1025 * 6 MSC 1045 * 4 MSC 4051	Saxophone—Kadri Gopalnath

Vocal

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* 6 MSC 6030	Vocal—Dr. M. L. Vasanthakumari
* 6 MSC 6035	Thyagaraja Krithis—S. Janaki
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* STEREO

BOXING

48 kg: 1. Sh. Sabirov (USSR), 2. H. Ramos (Cuba), 3. N. Mustafov (Bulgaria) and Uk Li Biong (DPRK).

51 kg: 1. P. Lesov (Bulgaria), 2. V. Miroshnichenko (USSR), 3. J. Varadi (Hungary) and H. Russell (Ireland).

54 kg: 1. Hernandez (Cuba), 2. B. Pinango (Hungary), 3. M. Anthony (Guyana) and D. Cipere (Romania).

57 kg: 1. R. Fink (GDR), 2. A. Horta (Cuba), 3. K. Kosedowski (Poland) and V. Rybakov (USSR).

60 kg: 1. A. Herrera (Cuba), 2. V. Demyanenko (USSR), 3. R. Nowakowski (GDR) and K. Adach (Poland).

63. kg: 1. P. Oliva (Italy), 2. S. Konakbayev (USSR), 3. A. Willis (Great Britain) and J. Aguilar (Cuba).

67 kg: 1. A. Aldama (Cuba), 2. J. Mugabi (Uganda), 3. K. Szczerba (Poland) and K. H. Kruger (GDR).

71 kg: 1. A. Martinez (Cuba), 2. A Koshkin (USSR), 3. D. Kastner (GDR) and J. Franek (Czechoslovakia).

75 kg: 1. J. Gomez (Cuba), 2. V. Savchenko (USSR), 3. J. Rybicki (Poland) and V. Silaghi (Romania).

81 kg: 1. S. Kacar (Yugoslavia), 2. P. Skrzecz (Poland), 3. H. Bauch (GDR) and R. Rojas (Cuba).

Over 81 kg: 1. T. Stevenson (Cuba), 2. P. Zayev (USSR), 3. I. Levai (Hungary) and J. Fanghanel (GDR).

YACHTING

Soling class: 1. Denmark (P. R. Jensen, V. Bandolowski, E. H. Hansen) 23.0, 2. USSR (B. Budnikov, A. Budnikov, N. Polyakov) 30.4, 3. Greece (A. Boudouris, A. Cavrilis, A. Rapanakis) 31.1.

Star class: 1. USSR (V. Mankin, A. Muzychenko), 2. Australia (H. Raudaschl, K. Ferstl), 3. Italy (D. Gorla, A. Peraboni).

Tornado class: 1. Brazil (A. Welter, L. Bjorkstorm), 2. Denmark (P. Due, P. Kjergard), 3. Sweden (G. Marstorm, J. Ragnarsson).

Flying Dutchman class: 1. Spain (A Abascal, M. Noguer) 19.0, 2. Ireland (D. Wilkins, J. Wilkinson) 30.0, 3 Hungary (S. Detre, Z. Detre) 45.7

470 class: 1. Brazil (M. Soares, E. Penido) 36 4, 2. GDR (J. Borowski, E. Swensson) 38.7, 3. Finland (J. Lindgren, G. Tallberg) 39.7.

Finn class: 1. Finland (E. Rechardt) 36.7, 2. Austria (W. Mayrhofer) 46.7, 3 USSR (A. Balashov) 47.4.

ROWING

Women

Single sculls: 1. S. Toma (Romania), 2. A. Makhina (USSR), 3. M. Schroter (GDR).

Double sculls: 1. USSR, 2. GDR, 3. Romania.

Coxless pairs: 1. GDR, 2. Poland, 3. Bulgaria.

Coxed fours: 1. GDR, 2. Bulgaria, 3. USSR.

Quadruple sculls: 1. GDR, 2. USSR, 3. Bulgaria.

Rights: 1. GDR. 2. USSR, 3. Romania.

Men

Single sculls: 1. P. Karppinen (Finland), 2. V. Yakusha (USSR), 3. P. Kersten (GDR).

Double sculls: 1. GDR, 2. Yugoslavia, 3. Czechoslovakia.

Coxless pairs: 1. GDR, 2. USSR, 3. Great Britain.

Coxed pairs: 1. GDR, 2. USSR, 3. Yugoslavia.

Coxless fours: 1. GDR, 2. USSR, 3. Great Britain.

Quadruple sculls: 1. GDR, 2 USSR, 3. Bulgaria.

Coxed fours: 1. GDR, 2. USSR, 3. Poland.

Eights: 1. GDR, 2. Great Britain, 3. USSR.

KAYAK AND CANOE

Women

Kayak singles, 500 m: 1. B. Fischer (GDR), 2. V. Gecheva (bulgaria), 3. A. Melnikova (USSR).

Kayak pairs, 500 m: 1. GDR, 2. USSR, 3. Hungary

Men

Kayak singles, 500 m: 1. V. Parienovich (USSR), 2. J. Sumegi (Australia), 3. V Diba (Romania).

Kayak pairs 500 m: 1. USSR, 2. Spain, 3. GDR.

Canoe singles, 500 m: 1. S. Postrekhin (USSR), 2. L. Lyubenov (Bulgaria), 3. O. Heukrodt (GDR).

Canoe pairs, 500 m: 1. Hungary, 2. Romania, 3. Bulgaria.

Kayak singles, 1000 m: 1. R. Helm (GDR), 2. A. Lebas (France), 3. I. Birladeanu (Romania)

Canoe singles, 1000 m: 1. L. Lyubenov (Bulgaria), 2. S. Postrekhin (USSR), 3. E Leue (GDR)

Kayak pairs, 1000 m: 1. USSR 2. Hungary, 3 Spain

Canoe pairs, 1000 m: 1. Romania, 2. GDR, 3 USSR

Kayak fours, 1000 m: 1 GDR, 2 Romania 3 Bulgaria

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Women

1. K. Losaberidze (USSR) 2491 (OR), 2. N. Butuzova (USSR) 2477, 3. P. Meriluoto (Finland) 2499.

Men

1. T. Polkolainen (Finland) 2455, 2. B. Isachenko (USSR) 2452, 3. G. Ferrari (Italy) 2448.

MODERN PENTATHLON

Team championship: 1. USSR 16126 pts., 2. Hungary 15912, 3. Sweden 15845.
Individual championship: 1. A. Starostin (USSR) 5568 points, 2. T. Szombathelyi (Hungary) 5502, 3. P. Lednev (USSR) 5382.

HANDBALL

Men

1. GDR, 2. USSR, 3. Romania.

Women

1. USSR, 2. Yugoslavia, 3. GDR.

DIVING

Women

Springboard: 1. Kalinina (USSR) 2. M. Proeber (GDR), 3. K. Guthuc (GDR).
Platform: 1. M. Jaschke (GDR), 2. S. Emirzyan (USSR), 3. L. Tsotadze (USSR).

Men

Springboard: 1. A. Portnov (USSR), 2. C. Giron (Mexico), 3. F. Cagnotto (Italy).
Platform: 1. F. Hoffmann (GDR), 2. V. Aleinik (USSR), 3. D. Ambartsumyan (USSR).

WATER POLO

1. USSR, 2. Yugoslavia, 3. Hungary.

191. OLYMPIC RECORDS

TRACK AND FIELD ATHLETICS

Men

Event	*Time*	*Name and Country*	*Year*
100 metres	9.95	James Ray Hines (USA)	1968
200 metres	19.83	Tommie C. Smith (USA)	1968
400 metres	43.86	Lee Edward Evans (USA)	1968
800 metres	1:43.5	Alberto Juantorena (Cuba)	1976
1500 metres	3:34.9	Hezekiah Kipchoge Keino (Kenya)	1968
5000 metres	13:20.4	Brendan Foster (GB & NI)	1976
10000 metres	27.38.4	Lasse Artturi Viren (Finland)	1972
Marathon	2hr 09:55.0	Waldemar Cierpinski (E. Germany)	1976
4×100 m relay	38.19	United States of America	1968
	38.19	United States of America	1972
4×400 m relay	2:56.1	United States of America	1968
20 km road walk	1 hr 23:36.0	Maurizio Damilano (Italy)	1980
50 km road walk	3 hr 49:24.0	Hartwig Gauder (E. Germany)	1980
110 m hurdles	13.24	Rodney Milburn Jr. (USA)	1972
400 m hurdles	47.64	Edwin Corley Moses (USA)	1976
3000 m steeplechase	8.08.0	Anders Garderud (Sweden)	1976

	ft	*in*	*m*		
High Jump	7	8¾	2.36	Gerd Wessig (E. Germany)	1980
Pole Vault	18	11½	5.78	Wladyslaw Kozakiewicz (Poland)	1980
Long Jump	29	2½	8.90	Robert Beamon (USA)	1968
Triple Jump	57	0¾	17.39	Viktor Saneyev (USSR)	1968
Shot Putt	70	0½	21.35	Vladimir Kiselyev (USSR)	1980
Discus Throw	224	0	68.28	Mac Maurice Wilkins (USA)	1976
Hammer Throw	268	4	81.80	Yuriy Sedykh (USSR)	1980
Javelin Throw	310	4	94.58	Miklos Nemeth (Hungary)	1976
Decathlon	8618points			W. Bruce Jenner (USA)	1976

Women

	Time		
100 metres	11.01	Annegret Richter (W. Germany)	1976
200 metres	22.03	Barbel Wockel (*nee* Eckert) (E. Germany)	1980

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400 metres	48.88	Marita Koch (E. Germany)	1980
800 metres	1:53.5	Nadezda Olizarenko (USSR)	1980
1500 metres	3:56.6	Tatyanya Kazankina (USSR)	1980
4×100 m relay	41.60	E. Germany	1980
4×400 m relay	3:19.2	E. Germany	1976
100 m hurdles	12.56	Vera Komissova (USSR)	1980

	ft	*in*	*m*		
High Jump	6	5½	1.97	Sara Simeoni (Italy)	1980
Long Jump	23	2	7.06	Tatyana Kolpakova (USSR)	1980
Shot Putt	73	6¼	22.41	Ilona Slupianek (E. Germany)	1980
Discus Throw	229	6	69.96	Evelin Jahl (*nee* Schlaak) (E. Germany)	1980
Javelin Throw	224	5	68.40	Maria Colon (Cuba)	1980
Pentathlon	5083	points		Nadezda Tkachenko (USSR)	1980

CYCLING

1000 m Time Trial	1:02.95	Lothar Thoms (E. Germany)	1980
4000 m Individual Pursuit	4:34.92	Robert Dill-Bundi (Switzerland)	1980
4000 m Team Pursuit	4:15.70	USSR	1980

SHOOTING

	Points		
50 m Small Bore Rifle (3 positions)	1173	Viktor Vlasov (USSR)	1980
50 m Small Bore Rifle (Prone position)	599	Ho Jun Li (North Korea)	1972
	599	Karl Heinz Smieszek (W. Germany)	1976
	599	Karoly Varga (Hungary)	1980
	599	Hellfried Heilfort (E. Germany)	1980
Free Pistol	581	Alexander Melentev (USSR)	1980
Rapid Fire Pistol	597	Norbert Klaar (E. Germany)	1976
Olympic Trap (Clay Pigeon)	199	Angelo Scalzone (Italy)	1972
Skeet	198	Evgeny Petrov (USSR)	1972
	198	Josef Panacek (Czechoslovakia)	1976
	198	Eric Swinkels (Netherlands)	1976
Running Game	589	Igor Sokolov (USSR)	1980
	589	Thomas Pfeffer (E. Germany)	1980

SWIMMING

Men

Event	*Time*	*Name and Country*	*Year*
Freestyle			
100 metres	49.99	James Montgomery (USA)	1976
200 metres	1:49.81	Sergei Kopliakov (USSR)	1980
400 metres	3:51.31	Vladimir Salnikov (USSR)	1980
1500 metres	14:58.27	Vladimir Salnikov (USSR)	1980
4×200 m Relay	7:23.22	United States of America	1976
Breaststroke			
100 metres	1:03.11	John Hencken (USA)	1976
200 metres	2:15.11	David Andrew Wilkie (GB & NI)	1976
Butterfly			
100 metres	54.27	Mark Spitz (USA)	1972
200 metres	1:59.23	Michael Bruner (USA)	1976
Backstroke			
100 metres	55.49	John Naber (USA)	1976
200 metres	1:59.19	John Naber (USA)	1976

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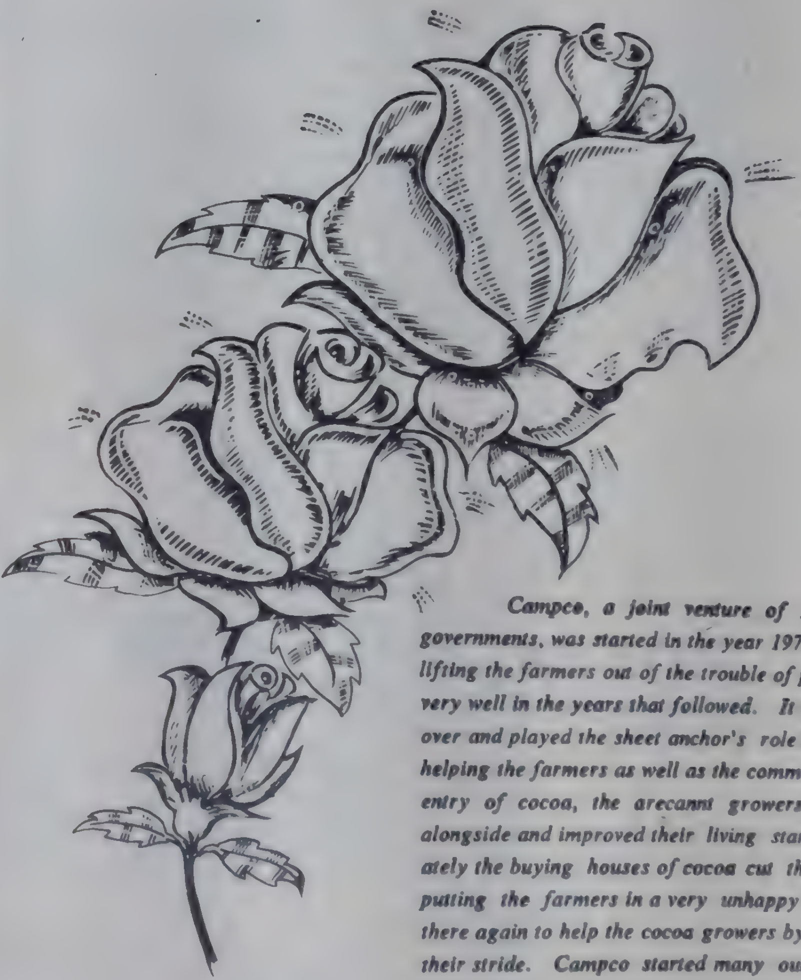

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Medley			
400 metres	4:22.89	Alexander Sidorenko (USSR)	1980
4×100 m Relay	3:42.22	United States of America	1976

Women

Freestyle			
100 metres	54.79	Barbara Krause (E. Germany)	1980
200 metres	1:58.33	Barbara Krause (E. Germany)	1980
400 metres	4:08.76	Ines Diers (E. Germany)	1980
800 metres	8:28.90	Michelle Ford (Australia)	1980
4×100 m Relay	3:42.71	E. Germany	1980
Breaststroke			
100 metres	1:10.11	Ute Geweniger (E. Germany)	1980
200 metres	2:29.54	Lina Kachushite (USSR)	1980
Butterfly			
100 Metres	1:00.13	Kornelia Ender (E. Germany)	1976
200 metres	2:10.44	Ines Geissler (E. Germany)	1980
Backstroke			
100 metres	1:00.86	Rica Reinisch (E. Germany)	1980
200 metres	2:11.77	Rica Reinisch (E. Germany)	1980
Medley			
400 metres	4:36.29	Petra Schneider (E. Germany)	1980
4×100 m Relay	4:06.67	E. Germany	1980

WEIGHTLIFTING

	Total	weight		
	Kilos	*lb*		
Flyweight	245	540	Kanybek Osmonoliev (USSR)	1980
Bantamweight	275	606¼	Daniel Nunez (Cuba)	1980
Featherweight	290	639¼	Viktor Mazin (USSR)	1980
Lightweight	342.5	755	Yanko Rusev (Bulgaria)	1980
Middleweight	360	793½	Asen Zlatev (Bulgaria)	1980
Light Heavyweight	400	881¾	Yurik Vardanyan (USSR)	1980
Middle Heavyweight	382.5	843¼	David Rigert (USSR)	1976
100 kg	395	870¾	Ota Zaremba (Czechoslovakia)	1980
Heavyweight	422.5	931¼	Leonid Taranenko (USSR)	1980
Super Heavyweight	440.0	970	Vasili Alexeev (USSR)	1976

ARCHERY

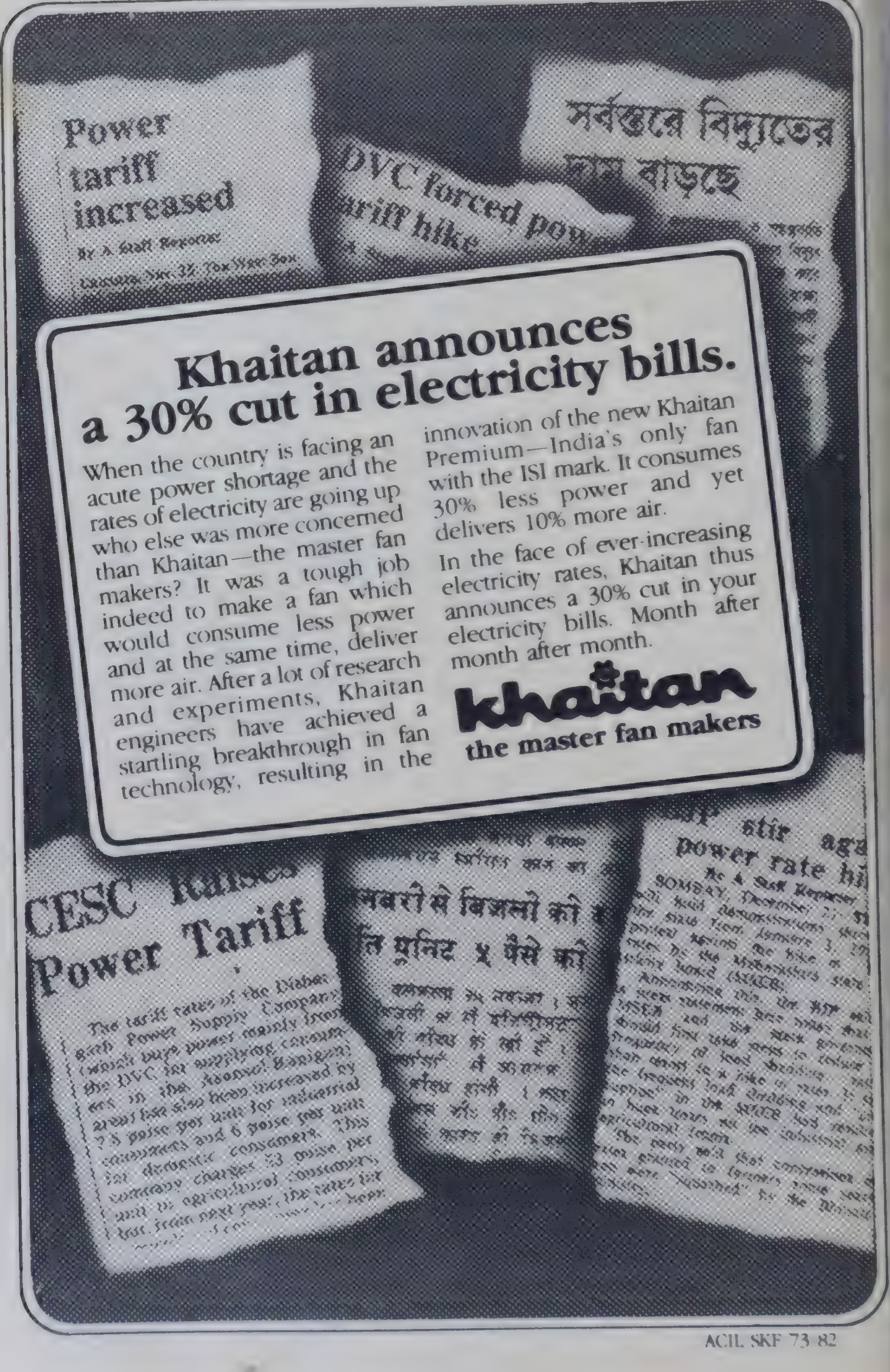
	Points		
Men's Double FITA	2571	Darrell Pace (USA)	1976
Women's Double FITA	2499	Luann Ryon (USA)	1976

192. WORLD RECORDS—MEN

A list of World's Records for the 32 scheduled men's events (excluding the walking records— see under *Walking*) passed by the International Amateur Athletic Federation as on 19 Aug. 1981. Fully automatic electric timing is mandatory for the six events up to the 400-metre distance.

Running

	Min sec	*Name and Country*	*Place*	*Date*
100 metres	9.95	James Ray Hines (USA)	Mexico City, Mexico	14 Oct. 1968
200 ,,	19.72	Pietro Mennea (Italy)	Mexico City, Mexico	12 Sept. 1979
400 ,,	43.86	Lee Edward Evans (USA)	Mexico, City, Mexico	18 Oct. 1968


Power tariff increased
By A Staff Reporter
DVC forced power tariff hike
সর্বস্তরে বিদ্যুতের দাম বাড়ছে
CESC Raises Power Tariff
stir against power rate hike
By A Staff Reporter

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In the face of ever-increasing electricity rates, Khaitan thus announces a 30% cut in your electricity bills. Month after month after month.

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800 ,,	1:41.72*	Sebastian Newbold Coe (GB & NI)	Florence, Italy	10 June 1981
1000 ,,	2:12.18*	Sebastian Newbold Coe (GB & NI)	Oslo, Norway	11 July 1981
1500 ,,	3:31.36	Steven Michael James Ovett (GB & NI)	Coblenz, W. Germany	27 Aug. 1980
1 mile	3:48.53	Sebastian New bold Coe (GB & NI)	Zurich, Switzerland	19 Aug. 1981
2000 metres	4:51.4	John George Walker, OBE (NZ)	Oslo, Norway	30 June 1976
3000 ,,	7:32.1	Henry Rono (Kenya)	Oslo, Norway	27 June 1978
5000 ,,	13:08.4	Henry Rono (Kenya)	Berkeley, California, USA	8 Apr. 1978
10,000 ,,	27:22.4	Henry Rono (Kenya)	Vienna, Austria	11 June 1978
20,000 ,,	57:24.2	Josephus Hermens (Netherlands)	Papendal, Netherlands	1 May 1976
25,000 ,,	1 hr 13:55.8	Toshihiko Seko (Japan)	Christchurch, New Zealand	22 Mar. 1981
30,000 ,,	1 hr 29:18.8*	Toshihiko Seko (Japan)	Christchurch, New Zealand	22 Mar. 1981
1 hour	20,944 m 13 miles 24 yd 2 ft	Josephus Hermens (Netherlands)	Papendal, Netherlands	1 May 1976

Hurdling

110 metres (3′ 6″ 106 cm)	12.93	Renaldo Nehemiah (USA)	Zurich, Switzerland	19 Aug. 1981
400 metres (3′ 0″ 91.4 cm)	47.13	Edwin Corley Moses (USA)	Milan, Italy	3 July 1980
3000 metres steeplechase	8:05.37	Henry Rono (Kenya)	Seattle, Washington, USA	13 May 1978

Marathon

There is no official marathon record because of the varying severity of courses. The best time recorded over 26 miles 385 yd 42.195 km (standardised in 1924) is 2 hr 08 min 33. 6 sec (av. 12.28 mph 19.77 km) by Derek Clayton (b. 17 Nov. 1942, Barrow-in-Furness, England) of Australia, at Antwerp, Belgium, on 30 May 1969. The best time by a British international is 2 hr 09 min 12 sec by Ian Thompson (b. 16 Oct. 1949) at Christchurch, New Zealand, 31 Jan. 1974. The fastest time by fa female is 2 hr 25 min 42 sec (av 10.79 mph 17.37 km/h) by Grete Waitz (Norway) (b. 1 Oct. 1953) at New York, US on 26 Oct. 1980. The fastest by a British woman is 2 hr 29 min 57 sec by Joyce Esther Smith (nee Byatt) (b. 26 Oct. 1937) at London on 29 Mar. 1981.

Relays

4×100 metres (two turns)	38.03	United States National Team: (William Collins, Steven Earl Riddick, Clifford Willey, Steven Williams)	Dusseldorf, W. Germany	3 Sept. 1977
4×200 metres	1:20.26*	University of Southern California, USA: (Joel Andrews, James Sanford, William Mullins, Clancy Edwards)	Tempe, Arizona, USA	27 May 1978
4×400 metres	2:56.16	United States National Team: (Vincent Edward Matthews, Ronald J. Freeman, George Lawrence James, Lee Edward Evans)	Mexico City, Mexico	20 Oct. 1968
4×800 metres	7:08.1	USSR Team: (Vladimir Podoliakov, Nikolai Kirov, Vladimir Malosemlin, Anatoli Reschetniak)	Podolsk, USSR	13 Aug. 1978

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* Denotes awaiting ratification.

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NEWDEAL

4x1500 metres	14:38.8	W. German Team (Thomas Wessinghage, Harald Hudak, Michael Lederer, Karl Fleschen)	Cologne, W. Germany	17 Aug. 1977

Field Events

	ft	in	m	Name and Country	Place	Date
High Jump	7	8¾	2,36	Gerd Wessing (E. Germany)	Moscow, USSR	1 Aug. 1980
Pole Vault	19	0¾	581*	Vladimir Poliakov (USSR)	Tbilisi, USSR	26 June 1981
Long Jump	29	2½	8,90	Robert Beamon (USA)	Mexico City, Mexico	18 Oct. 1968
Triple Jump	58	8½	17,89	Joao Carlos de Oliveira (Brazil)	Mexico City, Mexico	15 Oct. 1975
Shot Putt	72	8	22,15‡	Udo Beyer (E. Germany)	Gothenburg, Sweden	6 July 1978
Duscus Throw	233	5	71,16†	Wolfgang Schmidt (E. Germany)	East Berlin	9 Aug. 1978
Hammer Throw	268	4	81,80	Yuri Sedykh (USSR)	Moscow, USSR	31 July 1980
Javelin Throw	317	4	96,72	Ferenc Paragi (Hungary)	Tata, Hungary	23 Apr. 1980
	75	0	22,86	Brian Ray Oldfield (USA)	El Paso, Texas, USA	10 May 1975

Decathlon

8649 points	Guido Kraschemer (W. Germany) (1st day: 100 m 10.58 sec, Long Jump 7,80 m 25′ 7¼″, Shot Putt 15,47 m 50′ 9¼″, High Jump 2,00 m 6′ 6¾″, 400 m 48.04 sec)	Bernhausen, W. Germany (2nd day: 110 m hurdles 13.92 sec, Discus 45,25 m 149′ 4″, Pole Vault 4, 60 m 15′ 1″, Javelin 66,50 m 218′ 2″, 1500 m 4:24.15 sec)	14-15 June 1980

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* The time of 1:20.23 achieved by the Tobias Striders (Guy Abrahams, Mike Simmons, Donald O'Riley Quarrie, James Gilkes) at Tempe, Ariz, USA on 27 May 1978 was not ratified as the team was composed of varied nationalities.

‡ Note: One professional performance is superior to the IAAF mark, but the same highly rigorous rules as to measuring and weighing were not necessarily applied.

† Ben Plucknett (USA) threw 237 ft 4 in 72,34 m at Oslo, Norway on 7 July 1981 but was subsequently disqualified from competition.

WORLD RECORDS— WOMEN

A list of World's Records for the 22 scheduled women's events passed by the International Amateur Athletic Federation as at 19 Aug. 1981. The same stipulation about automatically timed events applies in the six events up to 400 metres as in the men's list.

Running

	Min sec	Name and Country	Place	Date
100 metres	10.88	Marlies Oelsner (now Gohr) (E. Germany)	Dresden, E. Germany	1 July 1977
200 metres	21.71	Marita Koch (E. Germany)	Karl Marx Stadt, E. Germany	10 June 1979
400 metres	48.60	Marita Koch (E.Germany)	Turin, Italy	4 Aug. 1979
800 metres	1:53.43	Nadezda Olizarenko (nee Mushta) (USSR)	Moscow, USSR	27 July 1980
1500 metres	3:52.47	Tatyana Kazankina (USSR)	Zurich, Switzerland	13 Aug. 1980
1 mile	4:21.68†	Mary Decker (USA)	Auckland, New Zealand	26 Jan. 1980
3000 metres	8:27.12	Ludmila Bragina (USSR)	College Park, Maryland, USA	7 Aug. 1976
5000 metres	15:28 43	Ingrid Christensen (Norway)	Oslo, Norway	11 July 1981
10000 metres	31:45.35	Loa Olofsson (Denmark)	Copenhagen, Denmark	6 Apr. 1981

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† Mary Decker ran 4:17.55 indoors at Houston, USA on 18 Feb. 1980.

Towards Self-sufficiency and Beyond . . .

Through the years of independence, the country has been trying to fulfil the ideals of a truly liberated nation. In Karnataka, every step towards individual self-sufficiency has been a balanced decision aimed at growth.

Efficient Administrative Machinery:
To tackle the root of the problem, the Administration has reorganised and geared itself for efficient working and speedy implementation of schemes. File clearance weeks are now a regular feature in all Departments and Organisations of Government, thereby speeding up decision-making.

Relief to Small Farmers:
To mitigate the hardships faced by small and marginal farmers, the Government has provided Rs. 100 crores of financial assistance along with concessions and reliefs.

Tenants Own Lands:
Tenants have been for centuries an exploited lot. Fully realising this, Karnataka has been a leader in helping 4.84 lakh farmers become land owners while 2.62 lakh acres of surplus land has been distributed to the landless tillers.

Impetus to Irrigation:
The country's economy is primarily fed by its agricultural output. A massive Irrigation Programme has helped water 1.20 lakh hectares. 5500 villages have direct supply of drinking water.

Electricity comes to 2,000 Villages:
2000 additional villages are being electrified and an additional 25,000 pumpsets now operate all over the State.

2.76 Lakh Families have Homes:
The lowliest of the low have been also provided with a roof over their heads totalling 2.76 lakh families, while 9.45 lakh families have their own plot of land. One lakh additional families will also be provided housing.

Every Village a School:
Ignorance is no more bliss. In a dynamic world, education can open vast vistas of self development. Primary education now reaches every small village in Karnataka.
Three more Universities have been created to facilitate higher standards in Collegiate education.

5.76 Lakh Families to Cross Poverty Line:
Scheduled Castes and Scheduled Tribes find a special place in the Government's plans. A Special Component Plan has been set in motion to uplift 5.76 lakh poor Scheduled Caste and Scheduled Tribe families.

In the Service of the Down-trodden:
Ashakiran, Negila Bhagya, Sagaradeepa, Munnede, Griha Kalyana are some of the novel schemes launched to brighten the lives of the down-trodden. A compassionate allowance of Rs. 75/- per month has been in operation to Thotigas, Talawars and Neeragantis who are in distress.

Kannadigas from all over the World to Meet:
Kannada, the State's official language will receive added impetus with the first-ever World Kannada Conference at Mysore in January 1983.
In Karnataka, every step towards individual self-sufficiency has been a balanced decision at growth.

Striving for a Better Future

karnataka information

Hurdling

100 metres (2' 9" 84 cm)	12.36	Grazyna Rabsztyn (Poland)	Warsaw, Poland	13 June 1980
400 metres (2' 6" 76 cm)	54.28	Karin Rossley (E. Germany)	Jena, E. Germany	18 May 1980

Relays

4x100 metres	41.60	E. German Team: (Romy Muller [nee Schneider], Barbel Wockel [nee Eckert],Ingrid Auerswald, Marlies Gohr [nee Oelsner])	Moscow, USSR	1 Aug. 1980
4x200 metres	1:28.15	E. German Team: (Marlies Gohr [nee Oelsner], Romy Muller [nee Schneider], Barbel Wockel [nee Eckert], Marita Koch)	Jena, E. Germany	9 Aug. 1980
4x400 metres	3:19.23	E. German NationalTeam: (Doris Maletzki, Brigitte Rohde, Ellen Streidt [nee Stropahl], Christina Brehmer [now Lathan)	Montreal, Canada	31 July 1976
4x800 metres	7:52.3	USSR National Team: (Tatyana Providokhina, Valentina Gerasimova, Svetlana Styrkina, Tatyana Kazankina)	Podolsk, USSR	16 Aug. 1976

Field Events

	ft	in	m	*Name and Country*	*Place*	*Date*
High Jump	6	7	2,01	Sara Simeoni (Italy)	Brescia, Italy	4 Aug. 1978
Long Jump	23	3¼	7,09	Vilma Bardauskiene — (USSR)	Prague, Czechoslovakia	29 Aug. 1978
Shot Putt	73	8	22,45†	Ilona Slupianek [nee Schoknecht] (E. Germany)	Potsdam, E. Germany	11 May 1980
Discus Throw	235	7	71,80	Maria Petkova (nee Vergova (Bulgaria)	Sofica, Bulgaria	13 July 1980
Javelin Throw	235	10	71,88	Antoaneta Todorova (Bulgaria)	Zagreb, Yugoslavia	15 Aug. 1981

Pentathlon (with 800 m)

5083 points (1971 Scoring Tables)	Nadezda Tkachenko (USSR) 100 m hurdles 13.29 sec; Shot Putt 16,84 m 55' 3"; High Jump 1,84 m 6' 0½" Long Jump 6,73 m 22' 1"; 800 m 2:05:20 sec)	Moscow, USSR	24 July 1980

Heptathlon

6716 points	Ramona Neubert (E. Germany) (100 m hurdles 13.70 sec. Shot Putt 15,41 m 50' 6¾"; High Jump 1,86 m 6' 1¼"; 200 m 23.58 sec; Long Jump 6,82 m 22' 4½"; Javelin 40,62 m 133' 3"; 800 m 2 min 06.72 sec)	Kiev, USSR	27-28 June 1981

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193. COMMONWEALTH GAMES

XII Commonwealth Games

Brisbane October 1982

Hosts Australia were overall champion in the gold medal standings with 39 gold. But in total medal standings England overtook Australia by one medal. England has 108 and Australia 107. Former Champion Canada was pushed back to third place with 82 medals in total—Gold-26.

Fight for the top honours was mainly between Australia and England. Australia once again proved its superiority in swimming. England finished a close second. Canada's Alex Baumann broke his own world record in 200 metres medley with a timing of 2:2.25.

Allen Wells of Scotland became the fastest athlete winning the men's 100 metres in 10.02 seconds. Angela Taylor of Canada was the fastest woman athlete bagging the 100 metres in 11 seconds. It is a Commonwealth record. Olympic and European champion Daley Thompson of England won the decathalon gold with 8,410 points. He could not better his world record of 8743 points, established at the European championship at Athens. India finished sixth in medal standings with a total of 16 medals—5 gold, 8 silver and 3 bronze. Bulk of the medals came from the wrestlers who won 4 gold, 4 silver and a bronze. The fifth gold was earned by Sayed Modi who won the Shuttle badminton singles title .

Ram Chander Sarang in 48 kg class, Mahabir Singh in 52 kg, Jagminder Singh in 68 kg and Rajinder Singh in 74 kg are the wrestlers who won gold for India. Silver medalists are Kartar Singh in 90 kg, Satpal Singh in 100 kg, Rajinder Singh in super heavy weight (100 kg plus) and Asok Kumar in 57 kg, Jai Prakash Kangar in 82 kg won bronze.

India won team silver in the centre fire class of the shooting events. Indian team, comprising Mohinder Lal and Ashok Kumar, secured 1138 points. In rapid fire, Indian team won bronze.

Medal Position

The final medal tally at Brisbane.

	Gold	*Silver*	*Bronze*	*Total*
Australia	39	39	29	107
England	38	38	32	108
Canada	26	23	33	82
Scotland	8	6	12	26
New Zealand	5	8	13	26
India	5	8	3	16
Nigeria	5	0	8	13
Wales	4	4	1	9
Kenya	4	2	4	10
Bahamas	2	2	2	6
Jamaica	2	1	1	4
Tanzania	1	2	2	5
Malaysia	1	0	1	2
Fiji	1	0	0	1
Hong Kong	1	0	0	1
Zimbabwe	1	0	0	1
Northern Ireland	0	3	3	6
Uganda	0	3	0	3
Zambia	0	1	5	6
Guernsey	0	1	1	2
Bermuda	0	0	1	1
Singapore	0	0	1	1
Swaziland	0	0	1	1

194. ASIAN GAMES

It is to India's credit that it took the initiative in organising a sports festival for Asian countries on Olympic lines. The first Asian Games were held at Delhi in 1951. Ever since, the Games have been held every four years in one Asian city or another as follows:

First Asiad	Delhi	1951
Second Asiad	Manila	1954
Third Asiad	Tokyo	1958
Fourth Asiad	Djakarta	1962
Fifth Asiad	Bangkok	1966
Sixth Asiad	Bangkok	1970
Seventh Asiad	Tehran	1974
Eighth Asiad	Bangkok	1978
Ninth Asiad	Delhi	1982

IX ASIAN GAMES

New Delhi 1982

Asian Games was the biggest sporting event in India in 1982. At the end of the ninth Asian Games held in New Delhi from November 19 to December 4, China emerged champions in seven of the 21 disciplines featured in the Games.

While they were on top in badminton, gymnastics, handball, rowing, shooting, table tennis and weight lifting, they also shared the glory with Japan and South Korea in basketball and volley ball.

Japan, placed second to China,reigned supreme in athletics, cycling, swimming and wrestling.

South Korea became champions in

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archery, boxing and tennis. India took first position in equestrian, golf and women's hockey and Pakistan in men's hockey and yatching.

Football was dominated by West Asian countries.

China ended up with the impressive gold tally of 61—four more than Japan. South Korea with 28 gold stood third, while India was placed fifth with 13 gold. India's tally of 13 golds was her highest since the inaugural Games in 1951.

The overall tally of 57 represented India's highest haul in Asiad, the previous best having been 52 in the inaugural Games in 1951 at New Delhi.

In all, 33 countries participated in the 15-day games. The largest contingent was from India (644) followed by Japan (462). Lebanon sent only a 10-member squad.

The following countries participated. Afghanistan 20. Bangladesh 103 (77 men, 5 women,21 officials). Bahrain 118 (72—3—43). Burma 70 (49—4—17). China 453 (224—88—141). South Korea 404 (266—79—59). Hong Kong 220 (124—60—36). Indonesia 201 (126—42—33). Iran 170 (149—0—21). Iraq 93 (80—0—10). Japan (462 (277—108—77). North Korea 340 (193—95—52). Kuwait 223 (160—0—63). Laos 16 (5—4—7). Mongolia 41 (25—1—5). Nepal 127 (91—10—26). Pakistan 138 (112—0—26). Philippines 245 (144—52—49). Qatar 79 (58—0—21). Saudi Arabia 260 (209—0—51). Singapore 70 (36—19—15). Sree Lanka 92 (61—13—18). Syria 72 (53—0—19). Thailand 256 (151—62—43). UAE 114 (87—0-27). Vietnam 29 (14—5—10). Yemen 102 (76—3—23). Yeman PDR 86 (62—4—20). India 644 (340—121—183).

The games opned on November 19, 1982 amidst solemn pageantry at the newly built Jawaharlal Nehru Stadium.

A near-capacity crowd of over 75,000 heard the President Zail Singh declaring open the Games, the biggest so far involving 33 nations and more than 4500 participants.

After the office-bearers of the Asian Games Federation were introduced to the President, the 33 teams marched into the Stadium in alphabetical order to the accompaniment of music.

Following the tradition, India the host country, marched last with Karni Singh carrying the flag.

President Zail Singh declared the Games open amidst fanfare and the release of 5000 balloons and 2000 pigeons with giant size Appus (baby elephants, the mascot of the games) tied to two balloons.

The torch lit by Prime Minister Indira Gandhi at the National Stadium earlier in the day was relayed by runners, including Maj. H.P.S. Ahluwalia, the disabled distinguished mountaineer, before it was brought into the stadium by the veteran athlete Gurbachan Singh and taken around by the flying Sikh Milkha Singh, and Kamaljit Sandhu. Balbir Singh, the former Indian hockey captain and Diana Simes were finally handed over the torch that lit the ceremonial flame which burned until the games closed on December 4.

The closing of the games was as spectacular as the opening. Thousands watched as the president of the Asian Games Federation mounted the Tribune of Honour and pronounced the 9th Asian Games closed, while at the same time calling upon the youth of Asia to reassemble at Seoul for the 10th Asian Games in 1986.

Athletics

Men

100m: 1. Rabuan Pit (Malaysia) 10.72 secs; 2. Jae Keun Jang (S. Korea) 10.72; 3. Suchart Jaesuraparp (Thailand) 10.76.

200 m: 1. Jae Keun Jang (S. Korea) 20.89 secs. (record, old—21.09 secs); 2. Toshio Toyoda (Japan) 21.13; 3. Rabuan Pit (Malaysia) 21.25.

400 m: 1. Susumu Takano (Japan) 46.65 secs; 2. K.K. Premachandaran (India) 47.27; 3. Guo Shunqi (China) 47.66.

The other Indian athlete, Pavittar Singh, was 5th in 47.72 secs.

800 m: 1. Charles Borromeo (India) 1 min. 46. 8 secs. (record; old—1 min. 47.6 secs.); 2. Bog Ju Kim (S. Korea) 1:47.55; 3. Hasan D. Mohammad (Iraq) 1.47.74.

1500 m: 1. Faleh M. Jarala (Iraq) 3 min. 43.49 secs. (record; old—3:47.30); 2. Yutaka Hirai (Japan) 3:45.26; 3. Suresh Jadav (India) 3:45.62.

Gurmukh Singh of India was 6th in 3:49.05.

5000 m: 1. Masanri Shintaki (Japan) 13 min. 53.74 secs. (record; old—14:20.6) 2. Zhang Gouwei (China) 13:58.09; 3. Rajkumar (India) 13:59.90.

10000 m: 1. Zhang Guowei (China) 29 min. 37.56 secs. (record; old—29:55.6); 2. Kenji Ide (Japan) 29:37.71; 3. Woh Keun Park (S. Korea) 29:38.17.

Shivnath Singh of India was 5th in 29 47 99

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110 m. Hurdles: 1. Yoshifumi Fujimori (Japan) 14.08 secs. (record, old— 14. 26 secs); 2. Zhang Shensheng (China) 14.51; 3. Parveen Jolly (India) 14.52

Satbir Singh of India was 4th in 14.55 secs.

400 m. Hurdels: 1. Takashi Nagao (Japan) 50.60 secs; 2. Shigendri Omori (Japan) 50.83; 3. Ahmed Jassim Hamada (Bahrein) 50.99.

India's K.S. Balasubramaniam was 4th in 51.78 secs. and Manjit Singh 5th in 52.10 secs.

4×100 men Relay: 1. China (Wang Shaoming, He baodong, Yu Zhuanghui, Yuan Guiqiang) 39.82 secs. (record; old—40.14), 2. Thailand 30.92; 3. Japan 39.97.

India (A. Sumariwalla, S. Abraham, S. Thyagarajan, A. Shetty) 4th in 40.63.

4×400 Relay: 1. Japan 3 min 06 75 secs. (record; old—3:07.04); 2. Iraq; 3. China.

3000 m. Steeplechase: 1. Tadasu Kauano (Japan) 8 min. 47. 3 secs; 2. Gopal Saini (India) 8:50.28; 3. Hector Begeo (Philippines) 8:52.40.

India's Pradeep Dogra was 4th in 9:2.55.

High Jump: 1. Zhu Jianhua (China) 2.33 metres (record; old—2.21); 2. Chu Chi (China) 2.22; 3. Takao Sakamoto (Japan) 2.16.

Long Jump: 1. Chong Il Kim (S. Korea) 7.94 metres; 2. Li Yuhuang (China) 7.89; 3. Junichi Usui (Japan) 7.87.

Pole Vault: 1. Tomomi Takahashi (Japan) 5.30 metres (record; old—5.10m); 2. Kamiya Tereuhisa (Japan) 5.11; 3. Cheng Zhang (China) 5.00.

Triple Jump: 1. Zhou Zhenxiang (China) 16.80 metres (record; old—16.56 m); 2. Yasushi Ueta (Japan) 16.23 m; 3. Balasubramaniam (India) 16.14 m.

Discus Throw: 1. lei Weinan (China) 58.50 metres (record; old—56.82); 2. Kuldip Singh (India) 53.50 m; 3. Li Zheng 53.34 m.

Hammer Throw: 1. Shigenobu Murofushi (Japan) 71.14 metres (record; old—68.25 m; 2. Masayuki Kawaita (Japan) 66.96 m, 3. Xie Yingqi (China) 64.48 m.

India's Ragbir Singh Pal 4th with 64.46 m and Sukhwant Sing 5th with 62.18 m.

Javelin Throw: Toshihiko Takeda (Japan) 75.04 metres; 2. Yeugn Yung Yang (S. Korea) 73. 62 m; 3. Gurtej Singh (India) 73.50 m.

India's Ompal Singh 4th with 71.58 m.

Shot Putt: Bahadur Singh (India) 18.53 metres (record; old—18.04); 2. Mohammed Abel (Kuwait); 3. Balwinder Singh (India).

20 km. Walk: 1. Chand Ram (India) 1 hour 29 mts. 29.00 secs. (record; old—1 hr. 31 min. 54.4 secs); 2. Wang Chuntang (China) 1 hr. 29 min. 50 secs; 3. Zhang Fuxin (China) 1 hr. 33 min. 34 secs.

50 km. Walks: 1. Wang Chuntang (China) 4 hrs. 9 mins. 36.00 secs. (record; old—5 hrs. 44 mins. 7.4 secs); 2. Qui Shiyong (China) 4 hrs. 19 mins. 43 secs; 3. Fujisaki Akira (Japan) 4 hrs. 39 mins. 41 secs.

India's Raghunath Singh 4th in 4 hrs. 57 mins. 20 secs.

Marathon: 1. Yang Kon Kim (S. Korea) 2 hrs. 2 mins. 21.00 secs; 2. Fumiaki Abe (Japan) 2 hrs. 24 mins. 9.00 secs; 3. S. Seetarama Kukkapa (India) 2 hrs. 25 mins. 7 secs.

India's Sarup Singh 5th in 2 hrs. 31 mins. 18 secs.

Decathlon: 1. Weng Kanquiang (China) 7431 pts. (record; old—7375 pts.). 2. Zhai Yingjin (China) 7232 pts; 3. Mansar Saleh (Qatar) 7009 pts.

Women

100 m: 1. Lydia de Vega (Philippines) 11.76 secs; 2. P.T. Usha (India) 11.95; 3. Myung Hee Mo (S. Korea) 11.99.

200 m: 1. Hiromi Isozaki (Japan) 24.22 secs; 2. P. T. Usha (India) 24.32 secs; 3. Myung Hee Mo (S. Korea) 24.49.

400 m: 1. Hiromi Isozaki (Japan) 54.43 secs; (record; old— 55.08), 2. Junko Yosida (Japan) 54.75; 3. Padmini Thomas (India) 55.14.

800 m: 1. Yong Ae Chang (N. Korea) 2. min. 05.61 secs. (record; old—2:05.71); 2. Gita Zutshi (India) 2:05.77; 3. Gup Cuimei (China) 2:06.59.

1500 m: 1. Yong Ae Chang (N. Korea) 4 min. 18.40 secs. (record; old—4:18.9); 2. Gita Zutshi (India) 4:19.33; 3. Ok Son Kim (N. Korea) 4:23.22.

India's Krishna Bose 8th in 4:32.42.

3000 m: 1. Ok Son Kim (N. Korea) 9 min. 30.32 secs; 2. Chun Hwa Kim (N. Korea) 9:32.36; 3. Shini Izutsu (Japan) 9:34.44.

100 m. Hurdles: 1. Emia Kimoto (Japan) 13.63 secs; 2. Chizuko Akimoti (Japan) 13.98; 3. Dai Jianhua (China) 14 secs.

India's Alphonsa Kurian 5th in 14.62 secs.

400 m. Hurdles: 1. M.D. Valsamma (India) 58.48 secs, (record, old—1 min. 32 secs); 2. Yumiko Aoi (Japan) 59.08; 3 Liu Guihua (China) 59.62.

India's Hamida Banu 6th in 1 min. 1.27 secs.

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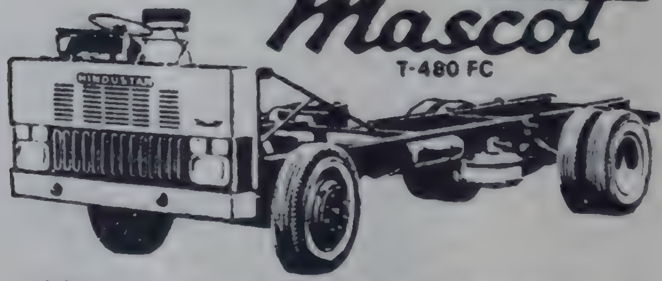

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Echo

4×100 m Relay: 1. Japan (Emiko Konishi, Hiromi Isozaki, Emi Akimoto, Junko Yoshida) 45.13 secs. (record; old—46.20 secs); 2. Thailand 45.97; 3. South Korea 46.27.

India 6th in 46.64.

4×400 m Relay: 1. Japn (H. Kashimoto, H. Yoshidi, I. Takahata, H. Isozaki) 3 min. 37.44 (Games record; old—3:43.5), 2. India (Rita Sen, Hamida Banu, Valsamma, Padmini Thomas) 3:38.32; 3. China 3:39.84.

High Jump: 1. Zhen Dehang (China) 1.89 metres (Games record; old—1.88 m); 2. Hisaya Fukumitsa (Japan) 1.87; 3 Yang Wengin (China) 1.83.

Long Jump: 1. Liao Wenfen (China) 6.41 metres (record; old—6.31 m); 2. Mercy Mathews (India) 6.26; 3. Li Huirong (China) 6.20

Discus Throw: 1. Li Xiao Hui (China) 57.24 metres (Games record; old—55.92 m); 2. Xin Xiaoyan (China) 32.20; 3. Harumi Suzukì (Japan) 47.20.

Javelin Throw: 1. Emi Matsui (Japan) 60.52 metres (record; old—57.22 m); 2. Li Shufen (China) 58.12 m; 3. Mori Minori (Japan) 54.70 m.

Shot Putt: 1. Li Meisu (China) 17.77 metres (record; old—17.70 m); 2. Shen Lijuan (China) 17.25 m; 3. Tetsuko Watase (Japan) 13.90 m

India's Vijayamala Datta was 4th with 13.48 m. and Bakhtawar Khambata 5th with 13.29 m.

Heptathlon: 1. Ye Peisu (China) 5.594 pts; 2. Ye Lianying (China) 5,493 pts; 3. Tomoko Uchida (japan) 5,432 pts.

Badminton

Team Championship: (Men) 1. China; 2. Indonesia; 3. South Korea and India. (Women) 1. China; 2. Japan; 3. South Korea and India.

Individual championship: Singles (Men) 1. Han Jian (China); 2. Liem Swie King (Indonesia); 3. Syed Modi (India) and Chen Changjie (China). (Women) 1. Zhang Ailing (China); 2. Li Lingwei (China); 3. Sumiko Kitada (Japan) and Yun Ja Kim (S.. Korea).

Doubles: (Men) 1. Christian Hadinata & Icuk Sugiarto (Indonesia); 2. Luan Jin & Lin Juangli (China); 3. Leroy D'Sa & Pradeep Gandhe (India) and Eun Ku Lee & Park Joo Bong (S. Korea). (Women) 1. Sun Ai Hwang & Heung Sook Kong (S. Korea) 2. Yun Ja Kim & Sang Hee Yoo (S. Korea); 3. Wu Dixi & Lin Ying (China) and Atsuko Tokuda & Yoshiko Yonekura (Japan). (Mixed) 1. Christian Hadinata & Ivana Lie (Indonesia); 2. Icuk Sugiarto & Ruth Damayanti (Indonesia); 3. Leroy D'Sa & Kanwal Thakur Singh (India) and Lin Jiangli & Lin Ying (China)

Basketball

Final Placings: (Men): 1. South Korea; 2. China; 3. Japan, India 8th. (Women): 1. China; 2. South Korea; 3. Japan, India 5th.

Boxing

Final Placings:

Light Fly 1. Yong Mo Heo (S. Korea); 2. Efren Tabanas (Philippines); 3. Seiki Segama (Japan) and Ali Bux (Pakistan).

Fly: 1. Sangom O Teeraporn (Thailand); 2. Babar Ali (Pakistan); 3. Chae O Kwon (S. Korea) and Kazuhiko Abe (Japan).

Bantam: 1. Sung Gil Moon (S. Korea); 2. Wanchai Pongari (Thailand); 3. Mohammed Mukhtar (Pakistan) and Song O Pyon (N. Korea).

Feather: 1. Ryon Sik Yo (N. Korea); 2. Ki Chul Park (S. Korea); 3. Haddad Nidal (Syria) and Sinji Higuchi (Japan).

Light: 1. Jo Ung Chong (N. Korea); 2. Hyun Kyu Kwon (S. Korea); 3. Jaslal Pradhan (India) and Fernando de Asis (Philippines)—both bronze.

Light Welter: 1. Kil Kim Dong (S. Korea); 2. Umpurnamaha Tawee (Thailand); 3. Son Chan Son (N. Korea) and Farouk J. Jawad (Iraq)—both bronze.

Welter: 1. Yong Beon Chung (S. Korea); 2. Bun Hwa Ryu (N. Korea); 3. Chenanda Machaiah (India) and Raymundo Suico (Philippines)—both bronze.

Light Middle: 1. Hae Jung Lee (S. Korea); 2. Imade Idriss (Syria); 3. Maluk Singh (India) and Niaz Mohammad (Pakistan).

Middle: 1. Nam Eui Lee (S. Korea); 2. Rajender Kumar Puneda (India); 3. Ahmed Al-Rabee (Kuwait) and Muzaffar Ahmed (Pakistan).

Light Heavy: 1. Kim Ko Hong (S. Korea); 2. Girwar Singh (India); 3. Un Yong Li (N. Korea) and Habibulla Khan (Pakistan).

Heavy: 1. Kaur Singh (India); 2. Ismail Salaman (Iraq); 3. Shambhu Khichengoi (Mongolia) and Bae Won So (S. Korea).

Super Heavy: 1. Bong Gil Cho (N. Korea); 2. Imatiaz Mahmood (Pakistan); 3. Naiem Shumais (Kuwait) and Kyun Ho Kim (S. Korea).

Cycling

100 km. Team Time Trial: 1. South Korea 2 hrs. 10 mins. 39.42 secs. (record—old: 2 hrs. 13 Mins. 38.61 secs.); 2. Japan 2 hrs. 15 mins. 05.96; 3. Iran 2 hrs. 16 mins. 14.96.

India 5th in 2 hrs. 18 mins. 47.65 secs.

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1000 m. Time Trial: 1. Tsutomo Sakamoto (Japan) 1 min. 09.15 secs. (record—old: 1 min. 11.15 secs.); 2. Young Soo Kim (S. Korea) 1 min. 10.78 secs; 3. Rodolfo Guaves (Philippines) 1 min. 13.17 secs.

India's Maxwell Trevor 8th in 1 min. 17.26 secs.

4000 m. Individual Pursuit: 1. Mitsugi Sarudate (Japan) 4 mins. 59.83 secs. (record) 2. Ju Seok Kim (S. Korea) 5 mins. 09.73 secs; 3. Liu Zuezhon (China) 5 mins. 15.65 secs.

India's Sikandar Singh 4th in 5 min. 18.61 secs.

4000 m. Team Pursuit: 1. Japan 4 mins. 40.89 secs; 2. South Korea 4 mins. 48.89 secs.; 3. Philippines 4 mins. 51.75 secs.

1000 m. Sprint: 1. Tsutomo Sakamoto (Japan) 11.58 secs. (In semifinal Sakamoto had broken the Games record, timing 11.30 secs.); 2. Katsuo Makatake (Japan) 11.60 secs.; 3. Young Soo Kim (S. Korea) 11.85 secs.

30 km. Point Race: 1. Akira Banda (Japan) 49 pts. 2. Matsuyozhi Takahashi (Japan) 35 pts; 3. Edgardo Pagarigan (Philippines) 32 pts.

180 km. Road Race: 1. Park Se Ryong (S. Korea) 4 hrs. 30 mins. 48.07 secs.; 2. Ganbold Tsedendam (Mongolia) 4 hrs. 30 mins 48.29 secs.; 3. Ali Zanggiabdi (Iran) 4 hrs. 30 mins. 48.34 secs.

In a field of 50 competitors India's C.M. Kurni was 18th, Amar Singh 32, Inderjeet Singh 34th and Dalbir Singh 35th.

Equestrian

Team: 1. India 389.5 penalty pts.; 2. Japan 1428 p. pts.; 3. Philippines 1507 p. pts.

Individual: 1. Raghubir Singh (India) 100.7 penalty points; 2. G.M. Khan (India) 113.8 p. pts.; 3. Prahlad Singh (India) 175 p. pts.

Show Jumping: 1. Nadia Al-Mittawa (Kuwait); 2. Gemilia (Kuwait); 3. Barah Al-Sabah (Kuwait).

Tent Pegging: 1. Maj Rupy Brar (India); 2. Fateh Khan (Pakistan); 3. Mukalaf Mahdi (Iraq).

Football

Final Placings: 1. Iraq; 2. Kuwait; 3. Saudi Arabia.

Golf

Final Placings: (Team) 1. India 878; 2 South Korea 893, 3 Japan 900 (Individual): 1. Lakshman Singh (India) 291; 2. Rajeev Mohta (India) 294; 3 Tetsuo Sakata (Japan) 296.

Gymnastics

Men's Team Competition: 1. China 290.650 pts.; 2. Japan 288.550 pts.; 3. North Korea 286.100 pts.

India 5th with 247.550 points.

Women's Team Competition: 1. China 193.300 pts; 2. North Korea 188.950 pts; 3. Japan 186.550 pts.

India 6th with 160.050 pts.

Men's Individual Competition: 1. Li ning (China) 117.250 pts; 2. Tang Fei (China) 117.150 pts; 3. Lee Hon Chol (N. Korea) 116.900 pts.

Women's Individual Competition: 1. Chen Yongyan (China) 78.200 pts.—record: old 75.95; 2. Wu Jiani (China) 78.050 pts.; 3. Jong Sil Choe (N. Korea) 77.450 pts.

India's Sanjivani Karandikar was 17th with 65.400 pts; Jayshree V. Bapat 18th with 64.050 pts. and Anju Dev 19th with 63.050 pts.

Men's Apparatus Championship: (Floor Exercise) 1. Tong Fei (China) 19.800 pts.; 2. Li Yuejin (China) 19.65 and Li Hon Chol (N. Korea) 19.65 (joint silver), No Bronze. (Horse Vault) 1. Lou Yun (China) 19.550; 2. Koji Gushiken (Japan) 19.400; 3. Ra Kwon (S. Korea) 19.300 and Li Su Gil (N. Korea) 19.300 (joint bronze). (Side Horse) 1. Li Ning (China), Li Xiaoping (China) and Li Hon Chol (N. Korea) 19.800 each. All three gold, no silver and bronze. (Roman Rings) 1. Li Su Gil (N. Korea) and Li Ning 19.800 each (joint gold, no silver); 3. Huang Yubin (China) 19.750. (Parallel Bars) 1. Koji Gushiken (Japan) 19.600; 2. Li Hong (Chol (N. Korea), Tong Fei (China) and Li Ning (China) 19.450 each (all three silver). No bronze. (Horizonal Bar) 1. Hirata Noritoshi (Japan) 19.800; 2. Morisue Shinji (Japan) 19.750; 3. Tong Fei (China) 19.700.

Women's Apparatus Championship: (Floor Exercise) 1. Jong Sil Choe (N. Korea) 19.850 pts; 2. Wu Jiani and Wen Jia (both China) 19.800 each—joint silver, no bronze. (Horse Vault) 1. Li Cuiling (China) 19.525; 2. Cheng Yangyan (China) 19.350; 3. Lee Jung Hee (S. Korea) 19.250. (Uneven Bar) 1. Wu Jiani (China) 19.800; 2. Jong Sil Choe and Li Jong Ae (both N. Korea) 19.750 each—joint silver/ no bronze. (Balancing Beam) 1. Wu Jiani (China) 19.800; 2. Yu Xiang (China) 19.300; 3. Morio Maiko (Japan) 19.200.

Handball

Final Placings: 1. China; 2. Japan; 3 South Korea.

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Hockey

Final Placings: (Men): 1. Pakistan; 2. India; 3. Malaysia. (Women): 1. India; 2. South Korea; 3. Malaysia.

Rowing

Single Sculls: 1. China 7 min. 05.41 secs; 2. Japan 8 min. 03.83 secs; 3. North Korea 8 min. 11.49 secs. India 4th in 8 min. 21.29 secs.

Coxed Pairs: 1. China 7 min. 57.71 secs; 2. Japan 8 min. 05.24 secs; 3. India 8 min 09.29 secs.

Coxwainless Pairs: 1. China 7 min. 42.14 secs; 2. Japan 7 min. 51.7 secs; 3. South Korea 8 min. 01.53 secs. India 4th in 8 min. 04.56 secs.

Coxed Fours: 1. China 7 min. 00.79 secs; 2. North Korea 7 min. 07.46 secs; 3. South Korea 7 min. 08.62 secs. India 5th in 7 min. 44.73 secs.

Swimming

Men

100 m. Freestyle: 1. Peng Siong Ang (Singapore) 53.00 secs. (record; old—54.01 secs); 2. Wan Qiang (China) 54.12; 3. Lukman Niode (Indonesia) 54.18.

200 m. Freestyle: 1. William Wilson (Philippines) 1 min. 57.41 secs; 2. Wu Jinhuang (China) 1:58.16; 3. Hoang Guohua (China) 1:58.23.

400 m. Freestyle: 1. Okuhira Terashita (Japan) 4 min. 08.71 secs; 2. William Wilson (Philippines) 4:10.09; 3. Wu Jinhuang (China) 4:10.30.

1500 m. Freestyle: 1. Kimiharo Anzai (Japan) 16 min. 21.82 secs; 2. Keisuke Okuno (Jap) 16:31.89; 3. William Wilson (Philippines) 16:38.30.

100 m. Back Stroke: 1. Kenji Ikeda (Japan) 59.91 secs. (record:old—1 min. 00.26 secs; 2. Hidetoshi Takahashi (Japan) 1.00.28; 3. Lukman Niode (Indonesia) 1:00.51

India's Wilson Cherian was 5th in 1:03.48

200 m. Back Stroke: 1. Hidetoshi Takahashi (Japan) 2 min. 08.33 secs (record—old 2:10.87); 2. Yang Xintian (China) 2:11.31; 3. Lukman Niode (Indonesia) 2:13.06.

India's Wilson Cherian was 5th in 2:18.41.

100 m Butterfly: 1. Taihei Saka (Japan) 57.27 secs. (record; old—57.59 secs), 2. Chao Chen (China) 58.37; 3. Peng Siong Ang (Singapore) 58.37

200 m. Butterfly: 1. Taihei Saka (Japan) 2 min. 04.97 (record; old—2 06 68) 2. Jun Young Bong (S. Korea) 2 06 82 3. Masakazu Hirata (Japan) 2:07.06

100 m Breast Stroke: 1. Ye Runcheng (China) 1 min. 05.93 secs; 2. Shigehiro Takahashi (Japan) 1.05.97; 3. Fu Jin (China) 1:06.45.

200 m. Breast Stroke: 1. Naritoshi Matsuda (Japan) 2 min. 25.99 secs; 2. Fu Jin (China) 2:26.66; 3. Shigehiro Takahashi (Japan) 2:27.99.

200 m. Individual Medley: 1. Li Zhongyi (China) 2 mins. 10.93 secs; 2. Keiichi Ohata (Japan) 2:11.87; 3. Shinji Ito (Japan) 2:16.12.

India's Khazan Singh 5th in 2:25.88

400 m. Individual Medley: 1. Keiichi Ohata (Japan) 4 min 39.86 secs. (record; old—4:4.80); 2. Jia Zhangpan (China) 4:45.26; 3. Shinji Ito (Japan) 4:52.52

India's Khazan Singh was 4th in 5:04.97.

4×100 m. Freestyle Relay: 1. China 3 mins. 33.74 secs. (record; old—3:35.91); 2. Japan 3:38.14; 3. Indonesia 3:41.05).

India 4th in 3:43.89.

4×200 m. Freestyle Relay: 1. Japan 7 min 49.76 secs; 2. China 7 min 50.47; 3. Indonesia 8 min 15.03.

India 4th in 8 min 15.81.

4×100 m. Medley Relay: 1. Japan 3 min 56.48 secs. (record: old—3:56.97); 2. China 3:57.02; 3. Indonesia 4:03.69.

India 6th in 4:11.05.

High Board Diving: 1. Hui Tong (China) 645.45 pts. (record; old—629.26 pts); 2. Ting Zhang (China) 642.27; 3. Masashi Nakashima (Japan) 576.42.

Spring Board Diving: 1. Li Konzheng (China) 695.73 pts; 2. Tan Liangde (China) 674.85; 3. Masashi Nakashima (Japan) 603.27

Waterpolo: 1. China; 2. Japan; 3. India.

Swimming
Women

100 m. Freestyle: 1. Kaori Yanase (Japan) 57.88 secs. (record; old—58.62 secs.); 2. Chikako Nakamori (Japan) 1. min 00.39 secs; 3. Sha Li (China) 1:01.15.

200 m Freestyle: 1. Kaori Yanase (Japan) 2 min. 06.12 secs. (record old—2:09.35); 2. Mika Sato (Japan) 2:09.75; 3. Li Miache (China) 2:11.34

400 m. Freestyle: 1. Mika Saito (Japan) 4 min. 25.72 secs. (record: old—4:31.35); 2. Junko Sakurai (Japan) 4:27.67; 3. See Yun Lee (S Korea) 4:34 02

800 m. Freestyle: 1. Naomi Sekido (Japan) 9 min 03.05 secs. (record); 2. Junko Sakurai (Japan) 9:10.47; 3 See Yun Lee (S. Korea) 9 20 92

India's Anita Sood 5th in 9 47.22

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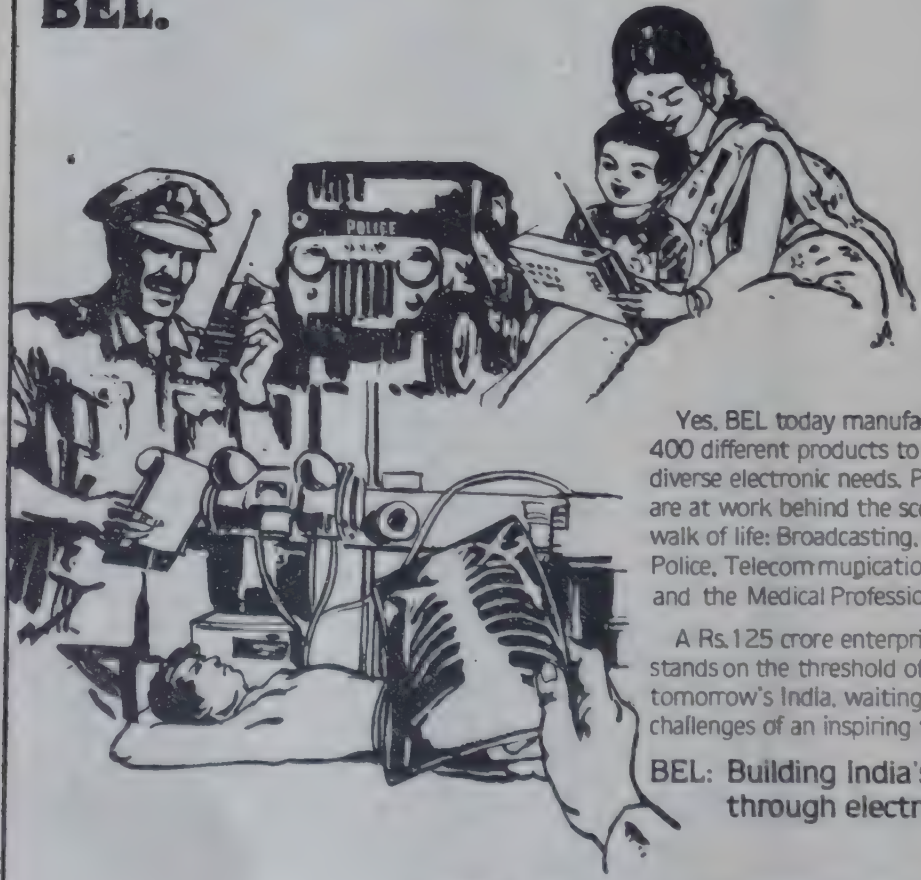

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100 m. Back stroke: 1. Youn Hee Choi (S. Korea) 1. min. 06.39 (record; old—1:06.74); 2. Youn Jung Choi (S. Korea) 1:06.98; 3. Kota Maeda (Japan) 1:08.24.

200 m. Back stroke: Youn Hee Choi (S Korea) 2 min 21.96 secs. (record; old—2:23.12); 2. Youn Jung Choi (S. Korea) 2:22.85. 3. Hisae Aseri (Japan) 2:27.36.

100 m Breast stroke: 1. Hiroko Nagasaki (Japan) 1 min. 12.73 secs.; 2. Myong Suk Kim (N. Korea) 1:14.85; 3. Hong Shaho (China) 1:15.15.

200 m Breast stroke: 1. Hiroko Nagasaki (Japan) 2 min. 33.78 secs. 2. Myong Suk Kim (N. Korea) 2:43.22; 3. Liang Weifeng (China) 2:45.46.

100 m. Butterfly: 1. Takemi Ise (Japan) 1 min. 02.22 secs. (record; old—1 min. 03 secs.); 2. Kiyomi Takahashi (Japan) 1:02.69; 3. Fan Lin (China) 1:04.81.

200 m. Butterfly: 1. Kiyomi Takahashi (Japan) 2 min. 16.63 secs; 2. Takemi Ise (Japan) 2:16.81; 3. Kum Hee Kim (S. Korea) 2:21.79.

200 m. Individual Medley: 1. Youn Hee Choi (S. Korea) 2. mins. 24.32 secs. (record; old 2:26.20); 2. Hideka Koshimizu (Japan) and Youn Jung Choi (S. Korea) 2:25.45 (dead heat). 4. Lian Weifen (China) 2:27.10.

Following the FINA (world swimming body) President's decision both Koshimizu and Youn Jung Choi who dead-heated in second spot were awarded silver and fourth-placed Liang was given the bronze which, however, would not count in China's medal tally.

400 m Individual Medley: 1. Hideka Koshimizu (Japan) 5 mins. 02.79 secs. (record; old—5:08.34 secs.); 2. Naomi Sekido (Japan) 5:07.09; 3. Eun Lee See (S. Korea) 5:08.26.

4×100 m. Individual Medley Relay: 1. Japan 4 mins. 21.32 secs. (record; old—4:27.16); 2. China 4:32.46; 3. South Korea 4:34.05

India 5th in 4:48.75.

High Board Diving: Wie Lu (China) 511.17 pts. (record; old—477.42 pts.); 2. Zhou Jihong (China) 496.62; 3. Yoshino Mabuchui (Japan) 433.05.

Spring Board Diving: 1. Li Yihua (China) 592.80 pts. (record; old—569.49 pts.); 2. Yan Shuping (China) 559.77; 3. Yoshino Mabuchi (Japan) 473.34

Shooting

Free Rifle-prone: (Team) 1. Mongolia 2363 pts.; 2. Japan 2362 pts.; 3. North Korea 2356 pts. (Individual) 1. Yugi Ogawa (Japan) 595 pts; 2. Gansoring (Gombousren (Mongolia) 594 pts; 3. Jose Medina (Philippines) 593 pts.

Free Rifle—3 Positions: (Team) 1. China 4593 pts; 2. South Korea 4533 pts; 3. North Korea 4501 pts. (Individual) 1. Deok Ha Yoon (S. Korea) 1144 pts; 2. Zhang Kezhong (China) 1141 pts; 3. Kim Yun Sob (N. Korea) 1139 pts. (Actually four Chinese shooters headed by Zhano Kezhong finished behind the South Korean winner but ahead of the rest, but because of the International Shooting Federation's regulation that no country can be awarded more than one medal sixth-placed Kim Yun Sob got the bronze).

Standard Rifle—3 Positions: (Team) 1. China 2261 pts.; South Korea 2254 pts; 3. Japan 2251 pts. India finished 5th behind North Korea. (Individual) 1. Deok Ha Yoon (S. Korea), India's Bhagirath Sharma was 12th with 561 pts.

Trap: (Team) 1. China 532 pts; 2. India 524 pts; 3. Japan 520 pts. (Individual) 1. Kaumu Watanabe (Japan) 189 pts; 2. Yu Hiaquan (China) 185 pts; 3. Randhir Singh (India) 185 pts. (Randhir, who had tied with Hiaquan, lost the silver in 25-shot tie-breaker in which the Indian scored 21 as against 23 by the Chinese)

10 m. Air Rifle: (Team) 1. China 2289 pts; 2. Japan 2255 pts; 3. North Korea 2254 pts. India 7th with 2181 pts. (Individual) 1. Wu Xiaoxuan (China) 584 pts. (world record by H. Stonyzad of Norway equalled); 2. Kim Bong Gil (N. Koreal) 571 pts; 3. Hiroyuki Nakajyo (Japan) 571 pts. (tie for silver and bronze was decided by counting inner ten)

10 m. Air Pistol: (Team) 1. North Korea 2288 pts; 2. China 2271 pts; 3. Japan 2252 pts. (Individual) 1. Gil Man So (N. Korea) 576 pts; 2. Wang Yifu (China) 573 pts; 3. Kongcharoen Prawat (Thailand) 568 pts. (Actually North Korea's Ghon lar Song (575 pts) and Kim Gi Jong (573 pts) were second and third respectively and China's Liu Jingsheng (571 pts 5th. But according to shooting rules no single country can get two medals in an event and hence Prawat placed sixth was given the bronze).

25 m. Rapid Fire Pistol: (Team) 1. China 2338 pts; 2. North Korea 2336 pts; 3. South Korea 2326 pts. (Individual) 1. Gil Man So (N. Korea) 594 pts record—old 593); 2. Park Ong Gil (S Korea) 592 pts; 3. Quoc Chung Nguyen (Vietnam) 591 pts. India's Sharad Chauhan was 6th with 582 pts

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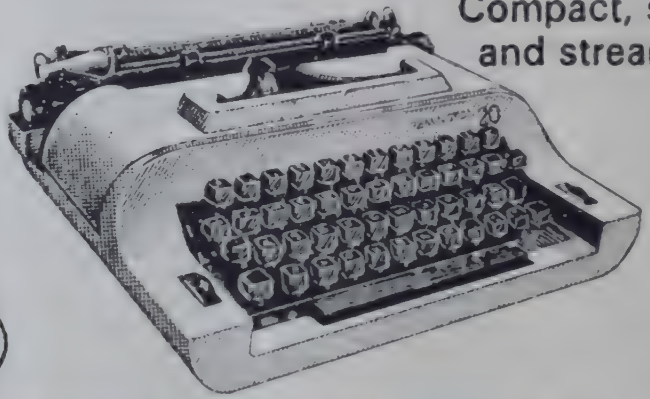

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25 m. Standard Pistol: (Team) 1. Japan 2235 pts; 2. China 2235 pts. (Japan beat China for gold in re-shoot); 3. South Korea 2234 pts. (India 5th with 2198 pts). (Individual) 1. Park Jong Gil (S. Korea) 565 pts; 2. Sharad Chauhan (India) 565 pts. (Gil beat Chauhan for the gold in re-shoot); 3. Deng Zening (China) 564 pts.

50 m. Free Pistol: (Team) 1. North Korea 2217 pts; 2. China 2211 pts; 3. Japan 2196 (Individual) 1. So Gil Man (N. Korea) 567 pts; 2. Tashiro Shifetoshi (Japan) 566 pts; 3. Wang Yifu (China) 559 pts.

25 m. Centre Fire Pistol: (Team) 1. North Korea 2333 pts; 2. China 2305 pts; 3. Thailand 2302 pts. (Individual) 1. So Gil Man (N. Korea) 587 pts. (record—old; 582 pts); 2. Chiewved Vijit (Thailand) 584 pts; 3. Deng Zining (China) 548 pts.

Skeet: (Team) 1. China 568 pts; 2. North Korea 563 pts; 3. Japan 562 pts. India 5th with 536 pts. (Individual) 1. Zu Chengu (China) 193 pts. (record—old; 190 pts) 2. Ma Il Lam (N. Korea) 191 pts; 3. Kim Ki Won (S. Korea) 188.

Table Tennis

Team championship: (Men) 1. China; 2. Japan; 3. South Korea. (Women) 1. China; 2. South Korea; 3. North Korea.

Individual championship: Singles: (Men) 1.Saike (China); 2. Kiyoshi Saito (Japan); 3. Seiji Ono (Japan) and Yong Ho Cho (N. Korea). (Women) 1. Cao Yanhua (China); 2. Tong Ling (China); 3. Yang Ja Young (S. Korea) and Yoon Kyong Mi (S. Korea).

Doubles: (Men) 1. Seiji Ono & Hiroyuki Abe (Japan); 2. Kim Won & Kim Ki Taek (S. Korea); 3. Hui Jun & Chen Xinhua (China) and Guo Yuehua & Xie Saike (China). (Women) 1. Cao Yanhua & Dai Lili (China); 2. Tong Ling & Bu Qijuan (China); 3. Yang Sook Li & Lim Jong Hua (N. Korea) and Yon Ok Chang & Gyong Suk Kim (N. Korea). (Mixed) 1. Xie Saike & Cao Yanhua (China); 2. Chen Xinhua & Tong Ling (China); 3. Kil Joong Yoon & Kyung Yoon (S. Korea) and Hiroyuki Abe & Keiko Yamashita (Japan).

Tennis

Team Championship: (Men): 1. Indonesia; 2. India; 3. China. (Women): South Korea; 2. China; 3. Japan.

Individual Championship: Singles—(Men): 1. Y. Tarik (Indonesia); 2. Kim Choon Ho (S. Korea); 3. Liu Shuhua (China); (Women); 1. E. Inoue (Japan) 2. Kim Soo Ok (S. Korea); 3. Yu Liquiao (China)

Doubles—(men): 1. Kim Choon Ho & Lee Woo Ryong (S. Korea); 2. Song Dong Wook & Jeon Yong Dae (S. Korea); 3. Liu Shuhua & Ma Kequin. (Women): 1. Shin Soon Ho & Kim Nam Sook (S. Korea); 2. J. Kimura & Kazuko Ito (Japan); 3. M. Yanagi & E. Inoue (Japan). (Mixed): 1. Kim Choon Ho & Shin Soon Ho (S. Korea); 2. Ichiro Nakanishi & Etsuko Inoue (Japan); 3. Y. Onishi & Masako Yanagi (Japan).

Weightlifting

52 kg: 1. Kazushito Manabe (Japan) Total 235 kg (snatch 105 kg; clean and jerk 130 kg); 2. Cai Juncheng (China) 235 kg (snatch 107.5 kg—record; Old: 105 kg; jerk 127.5 kg); 3. Suryaman Maman (Indonesia) 235 kg (snatch 105 kg jerk 130 kg).

The three tied in total but by virtue of lower body weight Manabe clinched the gold and Cai the silver.

India's Parvesh Chander Sharma was 4th with total lift of 212.5 kg (snatch 92.5 kg, jerk 120 kg).

56 kg: 1. Wu Shude (China) Total 267.5 kg—record; old: 250 kg. (snatch 122.5 kg—record; old 110 kg; jerk 145 kg); 2. Yang Eui Yong (N. Korea) 265 kg (snatch 112.5 kg; jerk 152.5 kg—record; old: 145 kg); 3. Chang Jehwan (China) 257.5 kg (snatch 120 kg; jerk 137.5 kg).

India's V. Sekhar was 7th with total lift of 237.5 kg (snatch 105 kg, jerk 132.5 kg and B.K. Satpathy 8th with total 232.5 kg (snatch 97.5 kg, jerk 135 kg).

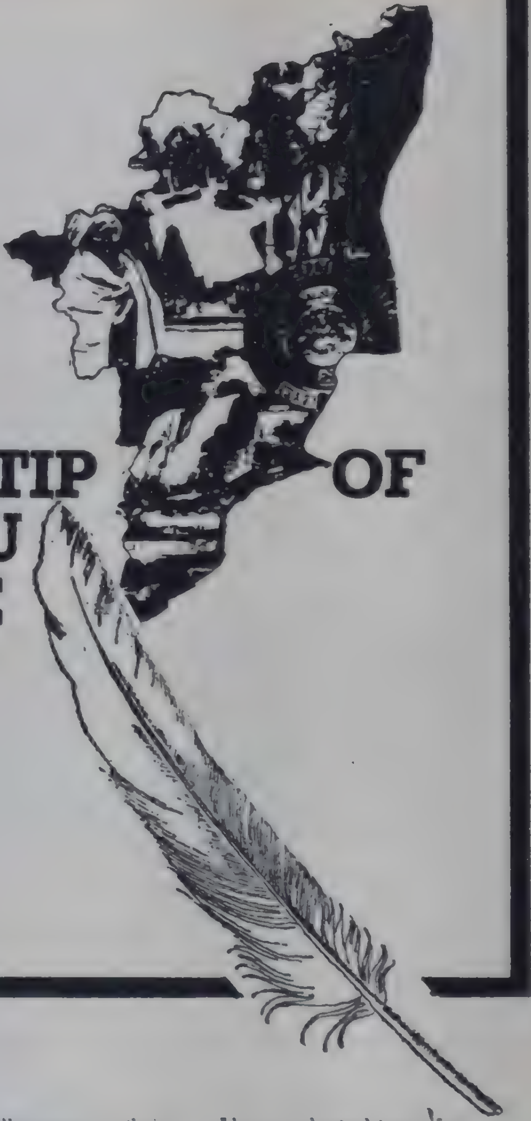
60 kg: 1. Chen Weigiang (China) Total 282.5 kg—record; old: 275 kg (snatch 122.5 kg—record; jerk 160 kg); 2. Lee Hui Bong (N. Korea) 277.5 kg (snatch 122.5 kg; jerk 137.5 kg); 3. Tan Yanyong (China) 275 kg (snatch 117.5 kg; jerk 157.5 kg)

India's Tamil Selvan, who was 7th with a total of 262.5 kg, broke the Indian Jerk record by lifting 142.5 kg.

67.5 kg: 1. Yao Jingyuan (China) Total 307.5 kg.—record (snatch) 137.5—record; jerk 170 kg—record); 2. Yatsuo Shimaya (Japan) 305 kg (snatch 135 kg; jerk 170 kg); 3. Zhao Xinhin (China) 297.5 kg (snatch 135 kg; jerk 162.5 kg).

India's J.M. Sapra was 8th with total 270 (snatch 117.5, jerk 152.5).

75 kg: 1. Pakizeh Djam Ali (Iran) Total 340 kg—new Games record (old: 310 kg) which also bettred Asian mark (snatch 155 kg, jerk 185 kg); 2. Li Shunzu (China) 327.5 kg (snatch 145 kg, jerk 182.5 kg); 3. Yassin Mohammed (Iraq) 317 kg (snatch 140 kg, jerk 177.5 kg).



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But then there are temples all over Tamil Nadu At Rameswaram, Madurai Srirangam, Thanjavur, Chidambaram, Kancheepuram —to name only a few

Temples are but one facet to the personality of Tamil Nadu For there are beach resorts. Like Covelong And Mamallapuram, with its monolithic monuments of the seventh century Hill stations Like Kodai, Ooty, Yercaud Wild life sanctuary at Mudumalai and Bird sanctuary at Vedanthangal

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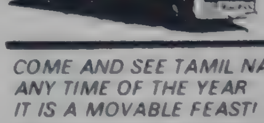
Also conducted tours for Madras city, Mamallapuram, Kancheepuram and Thirukkazhukundram



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82.5 kg: 1. Ryoji Isaoka (Japan) Total 350 kg—record: old 315 kg. (snatch 155 kg; jerk 195 kg—record; old: 185 kg); 2. Mohammad Traboulsi (Lebanon) 340 kg. (snatch 155 kg; jerk 185 kg); 3. Hung Sam Kim (N. Korea) 330 kg.

90 kg: 1. Ma Wenguang (China) Total 337.5 kg—record; old: 320 kg. (snatch 142.5 kg; jerk 195 kg—record); 2. Mehran Esslambouli (Iran) 335 kg. (snatch 150 kg; jerk 185 kg); 3. Kim Chul Hyun (S. Korea) 332.5 kg (snatch 147.5 kg; jerk 185).

100 kg: 1. Ahn Ji Young (S. Korea); Total 347.5 kg—Games as well as Asian record; old 325 kg. (snatch 157.5 kg—record; jerk 190 kg); 2. Kensuke Matsuo (Japan) 327.5 kg (snatch 142.5 kg; jerk 185 kg); 3. Gyan Singh Cheema (India) 320 kg (snatch 135 kg; jerk 185 kg).

110 kg: 1. Ahn hyo Jack (S. Korea) Total 350 kg—Games as well as Asian record (snatch 157.5 kg—record: old 140 kg; jerk 192.5 kg); 2. Pak Bong Jun (N. Korea) 337.5 kg. (snatch 142.5 kg; jerk 195 kg in third attempt—record; old: 185 kg); 3. Tara Singh (India) 335 kg (snatch 145 kg, jerk 190 kg.).

Over 110 kg: 1. Talal El Najjar (Syria) Total 360 kg—record; old 325 kg (snatch 155 kg; jerk 205 kg—record; old 180 kg); 2. Ali Vadi Deeris (Iran) 355 kg (snatch 155 kg; jerk 200 kg); 3. Meng Baidong (China) 350 kg (snatch 157.5 kg—record; jerk 192.5 kg).

India's Naville K Daroga 5th with total 325 kg (snatch 135 kg; jerk 190 kg).

Wrestling

Finals: (48 kg) 1. Takashi Tobayashi (Japan) 2. Chok Hwan (N. Korea); 3. Yap Do Son (S. Korea).

52 kg: 1. Toshio Ashakura (Japan); 2. Md. Hussain Tobaki (Iran), 3. Jong Ku Kim (S. Korea)

India's Mahavir Singh 4th.

57 kg: 1 Hideaki Tominama (Japan); 2. Mohammadin Assagari (Iran); 3. Ashok Kumar (India).

62 kg: 1. Hiroshi Kaneko (Japan); 2. Jung Kum Lee (S. Korea); 3. Ahmed Rezai Hagh (Iran).

India's Gyan Singh 4th.

68 kg: Buanelger Bold (Mongolia); 2 Massakaju Kamimura (Japan); 3. In Tak Ou (S. Korea).

India's Jagmander Singh 4th.

74 kg: 1. Md. Hussain Mohebi (Iran); 2. Go Jin Wo (S. Korea); 3. Choe Sang Mo (N. Korea)

India's Sarwan Singh 6th

82 kg: 1. Zeveg Duvchin (Mongolia); 2. Taj Md. Khairi (Afghanistan); 3. Gi Hong Pak (N. Korea).

90 kg: 1. Md. Hussain Mohebi (Iran); 2. Kartar Singh (India); 3. Ota Akira (Japan).

100 kg: 1. Satpal Singh (India); 2. D. Tserent Ogtokh (Mongolia); 3. Mahmood Gangu (Iran).

Over 100 kg: 1. Sukhte Sarai (Iran); 2. Farhan J. Mohammed (Iraq); 3. Rajendra Singh (India).

Volleyball

Final Placings: (Men) 1. Japan; 2. China; 3. South Korea. India 4th. (Women): 1. China; 2. Japan; 3. South Korea. India 6th

Yachting

Fireball: Farokh Tarapore and Zarir Karanjia (India) nil penalty pts; 2. N. Yagi and T. Tanaka (Japan) 31.1 p.p.; 3. P. Hasdin and T. Surapol (Thailand) 41.7 p.p.

Enterprise: 1. Byram Avari and Gospi Avari (Pakistan) 5.7 p.p.; 2. Jejee Unwalla and Fali Unwalla (India) 18 p.p.; 3. H. Inoue and H. Baba (Japan) 20.1 p.p.

OK Dinghy: 1. Khalid Akhtar (Pakistan) 3. p.p.; 2. Nagatsu (Japan) 27.4 p.p.; 3. C.S. Pradipak (India) 31.1 p.p.

Windglider: 1. T. Ishiwata (Japan) 11.4 p.p.; 2. P. Ortega (Philippines) 25.7 p.p.; 3. K. Choi (Hong Kong) 28.7 p.p.

Archery

Men

Team: 1. South Korea 3792 pts record—old: 3692); 2. Indonesia 3711 pts; 3. China 370 2 pts. India 8th with 3361 pts.

Individual: 1. Hiroshi Yamamoto (Japan) 1283 pts (record—old: Asian Games 1250 and Asian 1252); 2. Kim Young Won (S. Korea) 1275 pts; 3. Takavoshi Matsushito (Japan) 1275 pts. (Though there was a tie for the second spot the South Korean won the silver because of more gold hits). India's Pradip Kundu was 21st, Abhinav Gupta 23rd and Soumen Das 24th.

Women

Team: 1. South Korea; 2. North Korea; 3. China.

Individual: 1. Gwang Sun (N. Korea) 1295 pts; 2. Kim Jin Ho (S. Korea) 1294 pts: 3. Mi Young Kim (S. Korea) 1283 pts. India's Kaberi Das 10th with 1237 pts.

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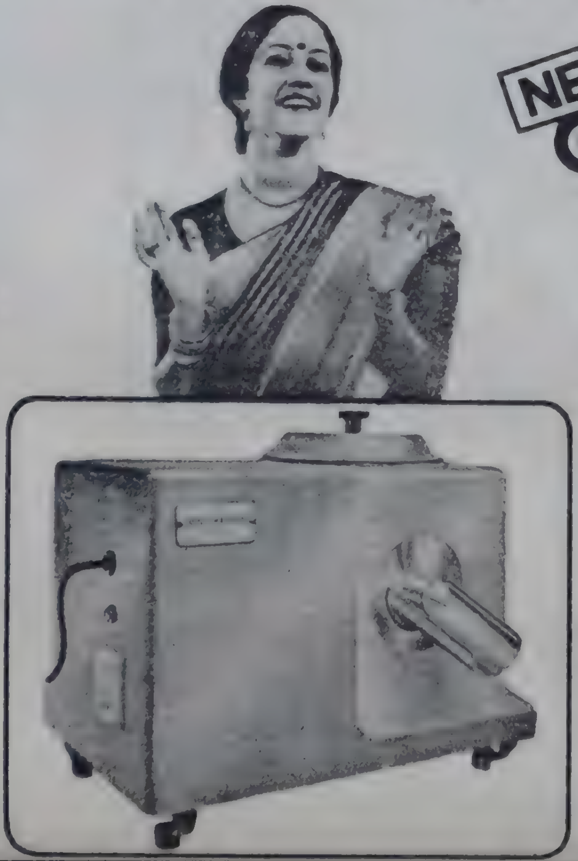

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Medals Tally

Country	*Gold*	*Silver*	*Bronze*	*Total*
China	61	51	41	153
Japan	57	52	44	153
South Korea	28	28	37	93
North Korea	17	19	20	56
India	13	19	25	57
Indonesia	4	4	7	15
Iran	4	4	4	12
Pakistan	3	3	5	11
Mongolia	3	3	1	7
Philippines	2	3	9	14
Iraq	2	3	4	9
Thailand	1	5	4	10
Kuwait	1	3	3	7
Malaysia	1	—	3	4
Singapore	1	—	2	3
Syria	1	1	1	3
Lebanon	—	1	—	1
Afghanistan	—	1	—	1
Hong Kong	—	—	1	1
Vietnam	—	—	1	1
Bahrain	—	—	1	1
Qatar	—	—	1	1
Saudi Arabia	—	—	1	1
Total	199	200	215	614

3 extra golds and 3 extra silvers were awarded in gymnastics, one extra silver awarded in swimming and both the losing semifinalists were given bronze medals in Badminton, Boxing, and Table Tennis.

195. TRACK AND FIELD WORLD CUP

Rome September 1981

European team won the men's trophy finishing with 147 points. East Germany came second with 130 points. The United States took the third place with 127.

East Germany was the overall winner in the women's events with 120.5 points. Europe was second and the Soviet Union third.

Asian Track and Field Championship

Tokyo June 1981

Japan emerged champions with 19 gold medals. China came second with 11 gold medals, followed by India with five.

Track & Field Results

	Gold	*Silver*	*Bronze*
Japan	19	20	15
China	11	4	2
India	5	5	9
Thailand	1	4	1
Kuwait	1	1	0
Malaysia	1	0	3
Philippines	0	2	1
Iraq	0	1	1
Saudi Arabia	0	1	1
South Korea	0	0	5

196. NATIONAL ATHLETICS CHAMPIONSHIPS

Calicut, January 1982

Kerala retained the overall team Championship with 190 points.

The team championships:

Men: Bihar 55 points
Women: Kerala 82 points
Boys: (under 19) Uttar Pradesh 38
Boys: (under 17) Punjab 21
Boys: (under 14) Punjab 19
Girls: (under 16) Kerala 32
Girls: (under 14) Assam 13

Best athletes:

Men: K.K. Premachandran (Kerala) 13 points.

Women: Surjit Kaur (Punjab) 11

Boys: (under 19) Abraham Mathew (Kerala) and Rami Reddy (Andhra Pradesh) 10 each.

Boys: (under 17) Allan John Soares (Maharashtra) 10.

Boys: (under 14) B. Islam (Assam) 10.

Girls: (under 16) Ibumungshi (Manipur) 15.

Girls: (under 14) Reetha Devi (Assam) 10

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Medal Standings

	G	S	B	Pts
Kerala	24	11	10	190
Punjab	13	12	14	115
Uttar Pradesh	8	5	5	60
Haryana	4	8	8	52
West Bengal	1	11	8	47
Bihar	8	7	2	63
Andhra	6	5	9	63
Karnataka	4	8	5	51
Maharashtra	6	2	6	49
Rajasthan	5	4	3	60
Manipur	6	0	2	32
Assam	4	3	1	30
Tamil Nadu	3	5	10	46
Orissa	0	3	5	18
Delhi	0	4	3	16
J and K	1	2	0	11
Madhya Pradesh	0	3	1	10
Tripura	1	0	0	5
Himachal	0	0	1	1
Gujarat	0	1	1	4

197. AQUATICS

World Aquatic Championship

GUAYAQUIL—August 1982

United States won the men's title with six golds. East Germany bagged the women's title with 10 golds, 7 silver and 2 bronze.

198. BOAT RACE

Among the States of India, Kerala alone has developed boating as a sport. The topography of Kerala, with its numberless rivers and extensive backwaters, has provided both the opportunity and the stimulus for aquatic sports. Racing boats in Kerala range from small sheath-like dug-outs that can carry just one person to very big boats that carry a crew of 80 to 120 people. Among the various types of racing boats, two deserve special mention, the *Oadi* and the *Chundan*.

The *Oadi*, literally the runner, is between 40 and 80 feet in length. Both its ends are built alike and look alike. This enables the boat to avoid right-about-turns. If a boat has to change its course in the opposite direction, all that is done is that the entire crew turn about in their seats and face the opposite direction.

The *Oadi* is a rather flat type, that hugs the water surface. Its ends (or tips) hardly rise 3 feet above the water surface. Both the ends are usually fashioned like a curled-in snake, rather loosely coiled, that is to say, with space between the coils. These *Oadies* should properly have been called *snake boats*, but they are not.

The Chundan. The designation *Snake boat* is applied to another type of boat that has little resemblance to a snake, coiled or otherwise. This type of boat is called *Chundan*, in Malayalam, which merely means pointed or sharp-tipped. It is much bigger than the *Oadi* and altogether different in design. The Chundan is eighty to a hundred-and-twenty ft. long and usually carries a complement of around 100 people, including the rowers. The front of the boat ends in a point or tip which is almost on a level with the water surface. The back, where the steersmen stand, rises in a steep curve to a height of 10 to 15 feet above the water. Thus while the back rises high in a majestic sweep, the pointed front practically polughs the water.

Though looming large and rising high, the *Chundan* can muster a speed faster than that of the *Oadi*, especially over a long distance, say, in about a mile. Its steersmen, 4 to 6 in number, can spur the boat into fantastic outbursts of speed—virtual leaps across the wate surface. This is a feat which calls for extraordinary skill and stamina from steersmen, especially the first two at the top. While the topmost steersmen send the boat leaping, the lower steersmen keep it on the right course. The *Chundan*, in a series of such leaps, can leave every other kind of boat far behind, at the finishing point.

The *Chundan* requires a long and fairly straight water course, wide enough to permit it to turn around easily. Its towering height, magnificent poise and high speed combine to make a *Chundan* race an unforgettable spectacle.

In 1952, Prime Minister Nehru was so fascinated with the performance of the *Chundans* that he donated a trophy and instituted a new race. The trophy has since been named *Nehru Trophy* and the race, the *Nehru Boat Race*. The trophy is a 1½-foot silver replica of a *Chundan*. The race is conducted in August every year at Punnamada, near Alleppey

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Nehru Trophy Boat Race

Alleppey Aug. 1982

In the Nehru Trophy Boat Race 1982 Snake Boat *Karichal* won the trophy covering the 1.5 km track in 4 minutes 54.5 seconds. Snake Boat *Vellam Kulangara* finished second.

GAMES

199. CRICKET

International Cricket

India, West Indies, Australia, England, New Zealand, Pakistan and Sri Lanka are the major cricket countries in the world. These countries play against one another in what are known as test matches.

West Indies vs Australia

First Test

Melbourne—December 1981

Australia won by 58 runs.
Score: Australia 198, 222. West Indies 201, 161.

Second Test

Sydney—January 1982

Test drawn.

Score: West Indies 384, 255. Australia 267, 200 for four.

Third Test

Adelaide—February 1982

West Indies won by five wickets.
Score: Australia 238, 386. West Indies 389, 239.

Australia Vs. New Zealand

First Test

Wellington—February 1982

Test drawn.
Score: New Zealand 266 for seven decl: Australia 85 for one

Second Test

Auckland—March 1982

New Zealand won by five wickets.
Score: Australia 210, 280. New Zealand 387, 109 for five.

Third Test

Christchurch—March 1982

Australia won by eight wickets.
Score: Australia 353, 69 for two. New Zealand 149, 272.

England Vs. Sri Lanka

Colombo—February 1982

England won by seven wickets.
Score: England 223, 171 for 3. Sri Lanka 218, 175

Sri Lanka Vs. Pakistan

First Test

Karachi—March 1982

Pakistan won by 204 runs
Score: Pakistan 396, 301 for four declared. Sri Lanka 344, 149.

Second Test

Faislabad—March 1982

Test drawn
Score: Sri Lanka 454, 154 for eight declared. Pakistan 270, 186 for seven.

Third Test

Lahore—March 1982

Pakistan won by innings and 102 runs.
Score: Sri Lanka 240, 158. Pakistan 500 for seven declared.

India Vs. England

First Test

Lords—June 1982

England beat India by seven wickets.
Score: India 128, 369. England 433, 67 for three.

Second Test

Manchester—June 1982

Test drawn.
Score: England 425. India 379 for eight

Third Test

The Oval—July 1982

Test drawn.
Score: England 594, 191 for three declared. India 410, 111 for three.

England won the series 1-0. Kapil Dev of India won 'Man of the Series'.

Pakistan Vs. England

First Test

Birmingham—July 1982

England won by 113 runs.
Score: England 272, 291. Pakistan 251, 199.

Second Test

Lords—August 1982

Pakistan won by ten wickets.
Score: Pakistan 428 for 8 decl:, 77 for no loss; England 227, 276

Third Test

Leeds—August 1982

England won by three wickets.
Score: Pakistan 275, 199. England 256, 219 for 7.

Australia Vs. England

First Test

Perth—November 1982

Test drawn.

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Second Test

Brisbane—December 1982

Australia beat England by 7 wickets to gain 1-0 lead

Score. Australia 341, 190 for 3 England 219, 309

Third Test

Adelaide—December 1982

Australia defeated England by 8 wickets.

Score: Australia 438, 83 for 2. England 216, 304.

Fourth Test

Melbourne—December 1982

England won by 3 runs.

Score: England 284, 294. Australia 287, 288.

Fifth Test

Sydney—January 1983

Test drawn.

Score. Australia 314, 382. England 237, 314 for 7. Australia regains the Ashes 2-1

World Cup Cricket (women)

Christchurch—February 1982

Australia retained the world cup women's cricket title, defeating England in the finals.

Ranji Trophy

New Delhi March 1982

Delhi made history with a victory over Karnataka by scoring 707 runs in their first innings to Karnataka's first innings score of 705 to lift Ranji Trophy for the third time. The highest score in Ranji match ever.

Roll of honour

Year	*Winners*	*Runners-up*
1934-35	Bombay	N India
1935-36	Bombay	Madras
1936-37	Nawanagar	Bengal
1937-38	Hyderabad	Nawanagar
1938-39	Bengal	S. Punjab
1939-40	Maha'tra	U. Provinces
1940-41	Maha'tra	Madras
1941-42	Bombay	Mysore
1942-43	Baroda	Hyderabad
1943-44	W India	Bengal
1944-45	Bombay	Holkar
1945-46	Holkar	Baroda
1946-47	Baroda	Holkar
1947-48	Holkar	Bombay
1948-49	Bombay	Baroda
1949-50	Baroda	Holkar
1950-51	Holkar	Gujarat
1951-52	Bombay	Holkar
1952-53	Holkar	Bengal
1953-54	Bombay	Holkar
1954-55	Madras	Holkar
1955-56	Bombay	Bengal
1956-57	Bombay	Services
1957-58	Baroda	Services
1958-59	Bombay	Bengal
1959-60	Bombay	Mysore
1960-61	Bombay	Rajasthan
1961-62	Bombay	Rajasthan
1962-63	Bombay	Rajasthan
1963-64	Bombay	Rajasthan
1964-65	Bombay	Hyderabad
1965-66	Bombay	Rajasthan
1966-67	Bombay	Rajasthan
1967-68	Bombay	Madras
1968-69	Bombay	Bengal
1969-70	Bombay	Rajasthan
1970-71	Bombay	Maha'tra
1971-72	Bombay	Bengal
1972-73	Bombay	Tamil Nadu
1973-74	Karnataka	Rajasthan
1974-75	Bombay	Karnataka
1975-76	Bombay	Bihar
1976-77	Bombay	Delhi
1977-78	Karnataka	UP
1978-79	Delhi	Karnataka
1979-80	Delhi	Bombay
1980-81	Bombay	Delhi
1981-82	Delhi	Delhi

Irani Trophy

New Delhi October 1982

Rest of India beat Delhi by 5 wickets to claim the Irani Trophy.

Duleep Trophy

Bombay October 1982

North Zone won the Duleep Trophy beating West Zone by 8 wickets

Deodar Trophy

Cuttack November 1982

West Zone beat North Zone by 13 runs to claim Deodhar Trophy.

Cooch Behar Trophy

Bombay January 1982

North Zone won the Cooch Behar Trophy Cricket championship dethroning South Zone by 3 wickets in the final

Vizzy Trophy

New Delhi February 1982

North Zone won the Vizzy trophy cricket championship defeating South Zone by an innings and 129 runs

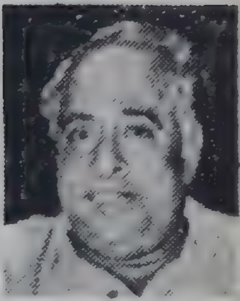
200. HOCKEY

Olympic Hockey

Hockey was introduced in the Olympics in 1908 when England won the gold medal.

The tournament was not held in 1912 and 1924 Olympics. The Games for 1916. 1940 and 1944 could not take place owing to the two world wars

The first time that India participated in International Hockey was in the 1928 Amsterdam Olympics. India has been a regular participant in the Olympics ever since



Following the footprints of Anna, the Government of Tamil Nadu has launched a massive Rural Welfare Programme of Self Sufficiency

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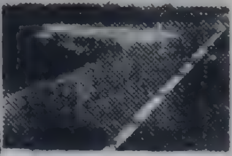

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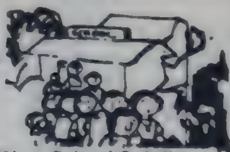

New School Buildings

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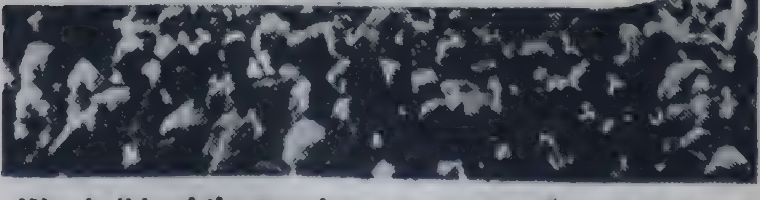

We shall lead the people to prosperity through the road of self sufficiency to build an egalitarian society.

Results of Olympic Games in which India participated are given below:

Year	*Place*	*Captains*	*Result*
1928	Amsterdam	Jaipal Singh (Bihar)	India won
1932	Los Angeles	Lal Shah Bukhari (Lahore)	India won
1936	Berlin	Dhyan Chand (Service)	India won
1948	London	Kishen (Rlys)	India won
1952	Helsinki	K.D. Singh Babu (UP)	India won
1956	Melbourne	Balbir Singh (Punjab)	India won
1960	Rome	L. Claudius (Bengal)	India beaten (0-1) Pakistan won
1964	Tokyo	Charanjit Singh (Punjab)	India won
1968	Mexico City	Gurubaksh & Prithipal Singh (Joint Captains)	Only 3rd place for India
1970	Munich	Harmik Singh	3rd place
1976	Montreal	Ajit Pal Singh	7th place
1980	Moscow	V. Bhaskaran	India won

Moscow Olympics

In Moscow India recaptured the Men's Hockey title after a lapse of 16 years by defeating Spain 4-3. It was the eighth gold in Olympic Hockey for India.

The Soviet Union taking part in the hockey competition for the first time captured the bronze by defeating Poland 2-1. Cuba beat Tanzania 4-1 to end in fifth place and Tanzania ended bottom of the six-team table.

Missing from the tournament were New Zealand, Australia and Pakistan, the three medal winners at the Montreal Games in 1976, who all pulled out as a result of the boycott which was supported by the Governments of their countries.

World Cup

The World Cup for Hockey was inaugurated in 1971 at Barcelona in Spain. In the inaugural meet the finalists were Pakistan and Spain. Pakistan won the trophy.

Second World Cup

1. Holland; 2. India; 3. W. Germany

Third World Cup

1. India; 2. Pakistan; 3. W. Germany.

Fourth World Cup

1. Pakistan; 2. Holland 3. Australia.

Fifth World Cup

Bombay—Jan. 1982

Pakistan annexed the World Cup for the third time defeating West Germany 3-1 in the final. Australia claimed the third place beating Holland 4-2. India finished a poor fifth outplaying U.S.S.R. (5-1) in the classification match.

Junior World Cup Hockey Championship

Kuala Lumpur—August 1982

West Germany became Junior World Hockey champions, defeating Australia 4-1 in final.

Asia Cup

Karachi—March 1982

Pakistan beat India 4-0 in the last and decisive match of the inaugural Asia Cup Hockey Championship.

Champion Trophy

Amsterdam—June 1982

Holland retained Champions trophy defeating Pakistan by a fantastic 7-2 margin.

Esanda Hockey

Melbourne—December 1982

Australia won the Esanda hockey championship defeating India 6-1 in the last of the league matches.

National Hockey Championship

Calcutta—February 1982

Punjab retained the Rangaswamy cup defeating Indian Airlines 5-3. This was Punjab's 14th victory

National Hockey

Roll of Honour

Year	*Venue*	*Winners*	*Runners-up*
1928	Calcutta	United Provinces	Rajputana
1930	Lahore	Combined Railways	Punjab
1932	Calcutta	Punjab	Bengal
1934	No competition		
1936	Calcutta	Bengal	Manavadar
1938	Calcutta	Bengal	Bhopal
1940	Bombay	Bombay	Delhi
1942	Lahore	Delhi	Punjab
1944	Bombay	Bombay	Gwalior
1945	Gorakhpur	Bhopal	United Provinces
1946	Calcutta	Punjab	Delhi
1947	Calcutta	Punjab	Delhi
1947	Bombay	Punjab	Bombay
1948	Bombay	Bhopal	Bombay
1949	Delhi	Punjab	Bengal
1950	Bhopal	Punjab	Bhopal
1951	Madras	Punjab	Services
1952	Calcutta	Bengal	Punjab
1953	Bangalore	Services	Punjab

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1954	Hyderabad	Punjab	Services
1955	Madras	Services and Madras joint-holders	
1956	Punjab	Services	UP
1957	Bombay	Railways	Bombay
1958	Bombay	Railways	Bombay
1959	Hyderabad	Railways	Services
1960	Calcutta	Services	UP
1961	Hyderabad	Railways	Punjab
1962	Bhopal	Punjab	Bhopal
1963	Madras	Railways	Services
1964	Delhi	Railways	Services
1965	Bombay	Punjab	Bombay
1966	Poona	Railways & Services joint-holders	
1967	Madurai	Madras and Railways joint-holders	
1968	Ootacamund	Railways	Mysore
1969	Cochin	Punjab	Railways
1970	Punjab	Punjab	Railways
1971	Bangalore	Punjab	Bombay
1972	Jullundur	Punjab	Railways
1973	Bombay	Services	Railways
1974	Poona	Railways	Tamil Nadu
1975	Bhopal	Railways	Tamil Nadu
1976	Cuttack	Railways	Services
1977	Madras	Railways and Indian Indian joint holders	
1978	Madurai	Indian Airlines	Railways
1979	Hyderabad	Indian Airlines	Railways
1980	Cuttack	Railways	Indian Airlines
1981	Punjab	Railways	

National Hockey
Women

Calicut—May 1982

Railways retained the national title defeating Punjab 3-0 in the finals.

Beighton Cup

Calcutta

Eastern Railway Athletic Association Calcutta and Electrical and Mechanical Engineers Jullunder were declared joint champions when they were locked goalless in second leg final and shared 12 goals in the two sets of the tie-breakers in 87th All India Beighton Cup Hockey tournament.

201. FOOTBALL

World Cup

Madrid—July 1982

Italy claimed the world cup Football championship defeating West Germany 3-1 in the final. Italy equalled Brazil's record of lifting the cup thrice winning this time after a gap of 44 years. After a goalless first half, the prolific Paolo Rossi scored in the twelfth minute of the second half to make his own tally of six goals the highest in the tournament. Mareo Tardelli in the 24th minute and Alessandro Altobelli in the 36th clinched the contest for Italy while Paul Breitner scored West Germany's lonely goal. Tardelli was adjudged the man of the match. Italy's Paolo Rossi carried off the two major individual awards at the 82 world cup finals. Rossi,the inspiration of the Italian team, took his prizes as player of the tournament and top scorer. Poland came from behind with three goals in three minutes and went on to beat France 3-2 for the third place

World Cup Statistics

World cup statistics. One hundred and fortysix goals in 52 matches. Average 2.8 per game.Leading individual scorer Paolo Rossi (Italy) six. Most individual goals in match:

Rossi, Karl-Heinz Rummeningge (West Germany), Zbiniew Boniek (Poland), Laszlo Kiss (Hungary)—three. Highest team aggregate in finals—Brazil 15.

Highest team score in one match Hungary 10×El Salvador

Best goal-keeping record: Peter Shilton (England) 426 minutes without conceding a goal.

Fastest goal—Byron Robson (England) 27 seconds×France (First phase).

Roll of honour

Year	*Place*	*Winners*	*Runners-up*
1930	Uruguay	Uruguay	Argentina
1934	Italy	Italy	Czechoslovakia
1938	Germany	Italy	Hungary
1950	Brazil	Uruguay	Brazil
1954	Switzerland	W. Germany	Hungary
1958	Sweden	Brazil	Sweden
1962	Chile	Brazil	Czechoslovakia
1966	England	England	W. Germany
1970	Mexico	Brazil	Italy
1974	Munich	W. Germany	Holland
1978	Buenos Aires	Argentina	Holland
1982	Madrid	Italy	W Germany

Olympic Soccer

List of Olympic Football winners is given below:

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Placings at Munich Olympics 1972 1. Poland, 2. Hungary, 3. Soviet Russia and East Germany

Winners in 1976 Olympics Montreal German Democratic Republic 3-1 Runners-up Poland (holders)

1980 Moscow Olympics

Placings 1 Czechoslovakia 2 GDR 3. USSR.

President's Cup

Seoul—June 1982

Operario (Brazil) and Hwarang (South Korea) were declared joint winners after they draw goalless in the final

Merdeka Trophy

Kuala Lumpur—August 1982

Brazilian selection humbled Ghana 3-0 to win Merdeka trophy

Jawaharlal Nehru Gold Cup

Calcutta—March 1982

Uruguay won the inaugural Jawaharlal Nehru Gold cup football tournament defeating China 2-0.

NATIONAL FOOTBALL

Santosh Trophy

Santosh Trophy was organised as an Inter-State National Tournament in 1941. Railways and Services take part in the tournament along with State teams.

Trichur—Jan. 1982

In the 38th National Football Championship Bengal etched its name on the trophy for the 20th time. It defeated Railways 2-0.

Role of Honour

Year	Winners	Runners-up	Venue
1941	Bengal	Delhi	Calcutta
1942-43	(Not held)	—	—
1944	Delhi	Bengal	Delhi
1945	Bengal	Bombay	Bombay
1946	Mysore	Bengal	Bangalore
1947	Bengal	Bombay	Calcutta
1948	(Not held)	—	--
1949	Bengal	Hyderabad	Calcutta
1950	Bengal	Hyderabad	Calcutta
1951	Bengal	Bombay	Bombay
1952	Mysore	Bengal	Bangalore
1953	Bengal	Mysore	Calcutta
1954	Bombay	Services	Madras
1955	Bengal	Mysore	Ernakulam
1956	Hyderabad	Bombay	Trivandrum
1957	Hyderabad	Bombay	Hyderabad
1958	Bengal	Services	Madras
1959	Bengal	Bombay	Nowgong
1960	Services	Bengal	Calicut
1961	Railways	Maharashtra	Bombay
1962	Bengal	Mysore	Bangalore
1963	Maharashtra	Andhra	Madras
1964	Railways	Bengal	Gauhati
1965	Andhra	Bengal	Quilon
1966	Railways	Services	Hyderabad
1967	Mysore	Bengal	Calcutta
1968	Mysore	Bengal	Bangalore
1969	Bengal	Services	Nowgong
1970	Punjab	Mysore	Madras
1971	Bengal	Railways	Madras
1972	Bengal	Tamil Nadu	Goa
1973	Kerala	Railways	Cochin
1974	Punjab	Bengal	Jullundur
1975	Bengal	Karnataka	Calicut
1976	Bengal	Maharashtra	Patna
1977	Bengal	Punjab	Calcutta
1978	Bengal	Goa	Srinagar
1979	Bengal	Punjab	Coimbatore
1980	Punjab	Railways	Cuttack

Junior National Football

Pondicherry

Bengal annexed the B.C. Roy Trophy defeating Kerala 1-0.

Sub Junior National Football

Calicut—April 1982

Kerala won the subjunior national finals defeating Assam 1-0.

Federation Cup

Calicut—May 1982

Calcutta Mohun Bagan won the Federation Cup defeating Mafathlal, Bombay in the final (1-0)

DCM Cup

New Delhi—January 83

Incheon University of South Korea lifted the D.C.M. Cup defeating Mohammaden Sporting, Calcutta 3-0 in the replayed final

I.F.A. Shield

Calcutta—September 82

Mohun Bagan won the I.F.A. Shield beating Mohammadens (2-1) in the finals

Stafford Cup Football

Bangalore—April 1982

Iraqi Air Force team defeated Mohun Bagan 1-0 in final to win the Stafford Cup

Vittal Trophy

Madras—August 82

Punjab Police annexed Vittal Trophy defeating Tamil Nadu Football Association Eleven (1-0)

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202. BASKETBALL

International

Basketball was introduced in Olympics in 1936. From 1936 onwards US has been consistently winning the Olympic title. In 1972 Russia dethroned US by a narrow margin, 51 points to 50.

1. Russia 2. US 3. Cuba.

In 1976 Olympics, United States regained the championship beating Yugoslavia in the final (95-74). USSR finished third. In the women's section, Russians won beating US to the second place. Bulgaria got the third place.

1980 Olympics*

Men	1. Yugoslavia, 2. Italy, 3. USSR.
Women:	1. USSR, 2. Bulgaria. 3. Yugoslavia.

Asian Basketball Confederation Championship

Calcutta—November 1981

China retained A.B.C. Championship for a record fourth time defeating South Korea 96-64 in the 11th Asian Basketball confederation Championship.

Asian Women's Basketball

Tokyo—May 82

South Korea emerged champions in the Asian Women's Basketball championship defeating Japan (86-60) in their last match.

National Basketball championship

Jamshedpur—January 1983

Services retained the men's National Basketball title defeating Rajasthan (66-65). In the women's section Punjab retained the title beating Kerala (64-46).

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* US did not participate.

203. VOLLEYBALL

Olympics

Volleyball was introduced in Olympics first at Tokyo in 1964. Russia won the Volleyball title both at Tokyo & Mexico. In 1972 in Munich, Japan annexed the Volleyball title for men, beating East Germany.

In 1976 Montreal, Poland captured the gold medal edging out the Russians in five sets (11-15, 15-13, 12-15, 19-17, 15-7)

Placings: 1. Poland, 2. USSR, 3. Cuba.

1980 Moscow Olympics

Men: 1. USSR, 2. Bulgaria, 3. Romania.
Women: 1. USSR, 2. GDR, 3. Bulgaria.

Wold Cup

Buenos Aires—October 82

Soviet Union won the world cup men's volleyball championship for the seventh time defeating Brazil 15-3, 15-4, 15-5.

Federation Cup

Kottayam—February 82

Kerala which got six points in the super league annexed the federation cup in the men's section. In the women's section Railways became the champions defeating Kerala in the super league 15-4, 8-15, 15-7, 15-10.

National Volley Ball Championship

Bhopal—January 1983

Haryana beat Uttar Pradesh and annexed the 31st men's national volleyball championship 15-13, 6-15, 15-9, 5-15, 15-8. Kerala women retained the title defeating Railways 12-15, 11-15, 15-10, 15-10, 17-15.

204. TENNIS

Wimbledon

London—July 1982

Men's Singles: Jimmy Connors of America staged a dramatic comeback to clinch the men's singles title dethroning John McEnroe in a thrilling five setter. Score: 3-6, 6-3, 6-7, 7-6, 6-4

Women's Singles: Martina Navratilova, the Czech defector, now a U.S. citizen, won the women's title dethroning Chris Evert Lloyd 6-1, 3-6, 6-2

Women's doubles: Martina Navratilova-Pam Shriver team beat Kathy Jordan-Anne Smith team 6-4, 6-1 in the finals to win the title.

Men's doubles: Peter Mcnamara-Paul Macnamee team beat Peter Fleming-John McEnroe team 6-3, 6-3 to win the men's doubles title

Roll of Honour

Year	*Men*	*Women*
1877	S.W. Gore	—
1878	P.F. Hadon	—
1879	J.T. Hartley	—

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1881	W Renshaw	—
1882	W. Renshaw	—
1883	W. Renshaw	—
1884	W. Renshaw	Miss Maud Watson
1885	W Renshaw	" "
1886	W. Renshaw	Miss Bingley
1887	H.F. Lawford	Miss L. Dod
1888	W. Renshaw	Miss L. Dod
1889	W. Renshaw	Mrs. G W Hillyard
1890	W.J. Hamilton	Miss L. Rice
1891	W. Baddeley	Miss L. Dod
1892	W. Baddeley	Miss L. Dod
1893	J. Pim	" "
1894	J. Pim	Mrs. G.W. Hillyard
1895	W. Baddeley	Miss C. Cooper
1896	H.S. Mahany	" "
1897	R.F. Doherty	Mrs. C.W. Hillyard
1898	R F. Doherty	Miss C. Cooper
1899	R.F. Doherty	Mrs. C.W. Hillyard
1900	R.F. Doherty	Mrs. C.W. Hillyard
1901	R F. Doherty	Mrs. A. Sterry
1902	A.W. Gore	Miss M.E. Robb
1903	H.L. Doherty	Miss D.K. Douglas
1904	H.L. Doherty	" "
1905	H.L. Doherty	Miss M. Sutton
1906	H.L. Doherty	Miss D.K. Douglas
1907	N.E. Brookes	Miss M. Sutton
1908	A.W. Gore	Mrs. A. Sterry
1909	A.W. Gore	Miss D.P. Boothby
1910	A.W. Wilding	Mrs. Lambert Chambers
1911	A.F. Wilding	" "
1912	A.F. Wilding	Mrs. Dr Lordcome
1913	A.F. Wilding	Mrs. Lambert Chambers
1914	N.E. Brookes	" "
1919	G L Patterson	Miss S. Lenglen
1920	W T. Tilden	" "
1921	W.T. Tilden	" "
1922	G.L. Patterson	" "
1923	W.M. Johnston	" "
1924	J. Borotra	Miss K. Metane
1925	R. Lacoste	Miss S. Lenglen
1926	J. Borotra	Miss L.A. Godfree
1927	H. Cochet	Miss H. Wills
1928	R. Lacoste	" "
1929	H. Cochet	" "
1930	W.T. Tilden	Mrs. F.S. Moody
1931	S.B. Wood	Frankein C. Aussem
1932	H.E. Vines	Mrs. F.S. Moody
1933	J.H. Crawford	" "
1934	F.J. Perry	Miss D.E. Rand
1935	F.J. Perry	Mrs. F.S. Moody
1936	F.J. Perry	Miss H.H. Jacobs
1937	J.D. Budge	Miss D.E. Rand
1938	J.D. Budge	Mrs. F.S. Moody
1939	R.L. Riggs	Miss A. Marble
1946	Y. Petra	Miss P. Betz
1947	J. Kramer	Miss M. Osbome
1948	R. Falkenburg	Miss L. Brough
1949	F.R. Schoeder	" "
1950	B. Patty	" "
1951	R. Savitt	" D. Hart
1952	F.A. Sedgeman	Miss M. Connolly
1953	V. Selas	" "
1954	J. Drobny	" "
1955	A. Traber	" L. Brough
1956	L.A. Hoad	" S. Fry
1957	L.A. Hoad	Miss A. Gibson
1958	A.J. Cooper	" "
1959	A. Olmedo	" M.E. Bueno
1960	N.A. Fraser	" "
1961	Rod Laver	" A. Mortimer
1962	Rod Laver	" J.R. Susman
1963	C.R. McKinley	" Margaret Smith
1964	S. Emerson	" M.E. Bueno
1965	R. Emerson	Miss Margaret Smith
1966	Manuel Santana	Mrs. Billie Jean King
1967	John Newcombe	" "
1968	Rod Laver	" "
1969	Rod Laver	Ann Jones
1970	John Newcombe	Mrs. Margaret Court
1971	John Newcombe	Miss Evonne Goolagong
1972	Stan Smith	Mrs. Billie Jean King
1973	Jan Kodes	" "
1974	Jimmy Connors	Chris Evert
1975	Arthur Ashe	Billie Jean King
1976	Bjorn Borg	Chris Evert
1977	Bjorn Borg	V. Wade
1978	Bjorn Borg	M. Navratilova
1979	Bjorn Borg	M. Navratilova
1980	Bjorn Borg	Evonne Cawley
1981	MacEnroe	Chris Evert

French Open championship

Paris—June 1982

Mats Wilander, the unseeded player from Sweden upset Guillermo Vilas of Argentina to win the French open men's title. Score: 1-6, 7-6, 6-0, 6-4.

Martina Navratilova won the women's title defeating Andrea Jaeger of America 7-6, 6-1 in the final.

U.S. Open championship

New York—September 1982

Jimmy Connors won the men's title defeating Ivan Lendl of Czechoslovakia 6-3, 6-2, 4-6, 6-4.

Chris Evert Lloyd defeated Hanna Mandlikova 6-3, 6-1 to win the women's title.

Davis Cup

Grenoble—November 1982

United States won the Davis Cup defeating France. It is the 28th Davis Cup title for the U.S. which has played in 53 finals

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Federation Cup Women's Tennis

Santa Clara—July 1982

United States won Federation Cup women's title for the 7th time, defeating West Germany 3-0 in the finals.

Asian Nations Cup

Kuala Lumpur—February 82

In the inaugural Asian Nations Cup tennis tournament India emerged champions defeating Japan (2-1).

Stuggart Grand Prix

Stuggart—July 82

Ramesh Krishna won Stuggart Grand Prix tennis tournament defeating America's Sandy Meyer 5-7, 6-3, 6-3, 7-6.

National Lawn Tennis Championship

Chandigarh—December 1982

S. Vasudevan defeated Jayakumar Royappa 6-1, 6-1 to win the men's singles title

Anu Peshwaria defeated Zenobia Irani 3-6, 6-4, 6-1 to claim the women's singles title.

National Hard Court Tennis

Bombay—March 1982

Sasi Menon won the singles title defeating Nandal Bal 7-6, 6-2.

Namrata Apparao won the women's title defeating Nirupama Mankad 6-4, 6-2.

205. BADMINTON

World Cup Badminton Tournament

Kuala Lumpur—September 82

Liem Swie King of Indonesia won the men's singles after defeating Malaysia's Misbun Sidek 15-12, 3-15, 15-12.

Lene Koppen of Denmark defeated Verawati Wiharjo of Indonesia in the women's singles finals 11-2, 11-10.

All England Tournament

London—March 82

Morten Frost of Denmark defeated Luan Jin of China (11-15, 15-2, 15-7) to take the men's singles title. Zhang Ailing of China defeated Li Linglei also of China in the women's singles (11-4, 11-6).

Danish Open Championship

Copenhagen—March 1982

Morten Frost of Denmark defeated Prakash Padukone of India in the singles final (15-7, 15-8).

Thomas Cup

London—May 1982

China ended Indonesia's supremacy in the men's international team badminton by winning the Thomas Cup final 5-4.

Hong Kong Open championship

September 82

Indias Prakash Padukone captured the men's singles title in the Hong Kong Open Badminton Championship defeating Chinese national champion Chen Tianlong 15-10, 8-15, 15-6

Indian Masters Badminton Tournament

Hyderabad—August 1982

Lius Pongoh (Indonesia) became the men's singles champion defeating Indonesia's Icuk Sugiarto (15-11, 15-5). In the women's section Jane Webster of England defeated Japan's Yoshiko Yonekura (11-3, 11-5)

Sweden's Thomas Kihlstrom and Stefan Karlsson won the men's doubles trouncing the fiery Korean duo of Bong Park and Eun Ku Lee (15-10, 15-11).

Gillian Gilks and Gillian Clarke won women's doubles.

National Badminton Championship

Udyogmandal—Jan. 1982

Singles Men: Syed Modi of Railways retained men's singles title with a convincing victory overy Maharashtra's Udaya Pawar 15-5, 15-9.

Singles Women: Madumita Goswami of Railways became the women's champion dethroning the holder Ami Ghia of B.A.I. 11-4, 11-4.

Doubles Men: Partho Ganguly and Vikram Singh (BAI) beat L. D'sa and Sanat Misra (Railways) 15-13, 15-10 in men's doubles final.

Doubles Women: Kanwal Thakur Singh and Sunitha beat Ami Ghia and Hufrish Nariman in the women's double final.

Mixed Doubles: Sanat Misra and Madhumita Goswamy (Railways) beat P.G. Ghengappa (Tamilnadu) and Kanwal Thakur Singh (Punjab) 15-12, 9-15, 15-1.

Team Championship
Rahimatoola Cup

Maharashtra lifted the Rahimatoola Cup beating the reigning champion Railways 3-2 in men's final

Chhadha Cup

Railway retained the Chhadha Cup defeating Maharashtra 3-0 in the women's final.

Junior Badminton National

Pune—January 1983

Amol Shah of Maharashtra won the Junior Badminton National boys title

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defeating Indrajit Mukherjee of West Bengal (14-17, 15-12, 15-8). Junior girls title was bagged by Maharashtra's Deepti Thanekar beating Namrata Phadnis of Maharashtra. Sub junior boys title went to M. Barua of Assam who defeated Anirath Rao of Andhra 15-4, 15-5. Punjab's Manjit bagged the Sub-junior girls title defeating Lopa Das of Assam (11-1, 11-6).

206. BALL BADMINTON

Trivandrum—March 1982

Major Ports Sports Control Board Team annexed Alladi Krishnaswamy Cup for the men's title defeating Tamilnadu 27—29, 29—10, 29—10. In the women's section Karnataka retained H.V. Parvarhamma Memorial Trophy defeating Kerala 29—1, 29—5.

207. TABLE TENNIS

World Table Tennis Championship

Novisad—April 1981

The all conquering Chinese made table tennis history by becoming the first country to win all the seven world titles. China turned the 26th world championships into a domestic affair by winning the men's and women's singles, men's and women's doubles and mixed doubles apart from the team events for men and women.

Men's Singles: Guo Yuehua beat Compatriot Cai Zhenhua 21—14, 17—21, 21—14, 21—16.

Women's singles: Tong Ling beat team mate Cuo Yan Hua 21—19, 16—21, 21—17, 18—21, 21—15.

Men's doubles: Li Zhenshi and Cai Zhenhua beat Xic Saile and Guo Yuahua (China) 21—17, 21—16, 19—21, 21—11.

Women's Doubles: Zhang Deying and Cao Yan Hua defeated Tong Ling and Pu Qujuan, their compatriots 21—15, 21—22, 12—10.

Team Championship

Swaythling Cup: China beat Hungary 5—2, to win the men's team Championship.

Corbillion Cup: China retained the women's team championship for the fourth successive year smashing South Korea 3—0.

Sixth Asian Table Tennis Championship

Djakarta May—1982

China made a clean sweep of the team titles. The Chinese trounced Japan 5—0 in the men's section while they overwhelmed Japanese women 3—0. Indian men took the seventh position and women got the 5th.

Sixth Commonwealth Table Tennis Championship

Bombay—February 1982

Nigeria's Atanda Musa became the Commonwealth Table Tennis Champion. He defeated Canada's Zoran Kosanovic (21—17, 21—23, 21—14, 21—19). England's Carole Night became the women's Champion defeating Alison Gordon (England).

208. CHESS

International

Chess, the king of indoor games, originated in India. It was believed until recently, that chess was invented in India, around 570 A.D. The latest researches by Soviet archaeologists show that chess was prevalent in India as early as the 2nd century A.D. It must have been invented much earlier. Chess passed from India to Persia and from there, it spread to Europe. The Indian chess known as *Chathuranga* (Chathur-four, anga-limbs) represented the four-fold arms of ancient India—the horse, the chariot, the elephant and the foot soldier commanded by the King (Deva) and his Minister (Mantri).

In the west, the pieces changed their names. *Deva* of the Indian chess was appropriately renamed *King; Mantri* (Minister) was rather incongruously replaced by *Queen* and the *Elephant* by the *Bishop*. The *Horse* continued under the name of *Knight* and the *Chariot* as the *Rook*. The foot soldiers became *Pawns*. The moves were also altered. The practically powerless Minister (Mantri) of the Indian chess became the all-powerful Queen who moved in all directions—lengthwise, crosswise and diagonally. The moves of the Bishop were also changed from those of the Indian Elephant. All the other pieces have retained the old Indian moves

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while away their long winter days. Modern chess in fact was nursed and nourished by the Russians. Their long experience in the game enabled them to produce a crop of chess champions.

World Chess Championship

Year	*Name*	*Country*
1851-58	Adolph Anderssen	Germany
1858-62	Paul C. Morphy	US
1862-66	Adolph Anderssen	Germany
1866-94	Wilhelm Steinitz	Austria
1894-1921	Emmanuel Lasker	Germany
1921-27	Jose Capablanca	France
1927-35	Alexander Alekhine	France
1935-37	Max Euwe	Netherlands
1937-46	Alexander Alekhine	France
1948-57	Mikhail Botvinnik	USSR
1957-58	Vassily Smyslov	USSR
1958-60	Mikhail Botvinnik	USSR
1960-61	Mikhail Tal	USSR
1961-63	Mikhail Botvinnik	USSR
1963-69	Tigran Petrosian	USSR
1969-72	Boris Spassky	USSR
1972-75	Bobby Fischer	US
1976—	Anatoly Karpov	USSR
1978—	Anatoly Karpov	USSR

World Chess Championship

Merano—Nov. 1981

Anatoly Karpov of the Soviet Union won a decisive sixth victory and retained his title as world chess champion when challenger Viktor Korchnoi resigned in the 18th game. Karpov won games 1, 2, 4, 9, 14 and 18. Korchnoi won games 6 and 13. The rest of the games were draws. The first player to reach six victories was to hold the championship.

Chess Olympics

Buenos Aires—Nov. 1978

Hungary ended the Soviet Union's long domination of team chess by winning the 23rd chess Olympics.

The Hungarians defeated Yugoslavia 3-1 in the final round of the 65-nation tournament to finish a point ahead of the Soviet Union, which defeated Holland 2-5,1-5.

Hungary thus won its third chess Olympics title and its first since 1928—long before the Soviet Union entered the bi-annual event for the first time and began a series of 12 straight world championships.

The Hungarian foursome won the two-week tournament with 37 points in 14 rounds to 36 for the Soviet Union

Women's Chess

Buenos Aires—Nov. 1978

The Soviet Union clinched the Chess Olympics Women's title pushing Yugoslavia to the second place.

World Junior Chess

Copenhagen—August 1982

Andrei Sokolov of Soviet Union won the World Junior Chess Championship with 10 points. Higor Stohl (Czechoslovakia) is runner up with 9 points.

National Chess

The National Chess Championship was officially instituted in 1955 at Eluru, Andhra Pradesh. The winners were bracketed—R.B. Sapre of Maharashtra and D. Venkaiya of Andhra Pradesh. The tournament was conducted biennially.

In 1957, at Poona, Ramdas (UP) won the championship with Manuel Aaron (Tamil Nadu) a close second. In 1959 at Delhi, Aaron won the title. He retained it at Hyderabad in 1961. In 1963, Farook Ali (then of Bombay, now of AP) won the title at Bombay. Rusi Madon of Bombay became champion in 1965 at Madras.

In 1967 the system was changed. Instead of the one Swiss system tournament, followed until 1965, a two-tier system was introduced from 1967 onwards—one, the qualifying 'B' tournament played on the Swiss system and the final 'A' on a league basis. The participants in the 'A' tournaments are the players who qualified in 'B' and the first six of the previous year's tournament, who were seeded. Aaron regained the title, under the new system in 1969 at Bangalore and retained it at Bikaner in 1971.

National Chess (Team)

Bangalore—April 1982

Tamil Nadu won the National Team Chess Championship with 18.5 points from six rounds. Maharashtra is runner up with 15 points

National Men's Chess

Kanpur—March 1982

Pravin Thipsay claimed the national chess title

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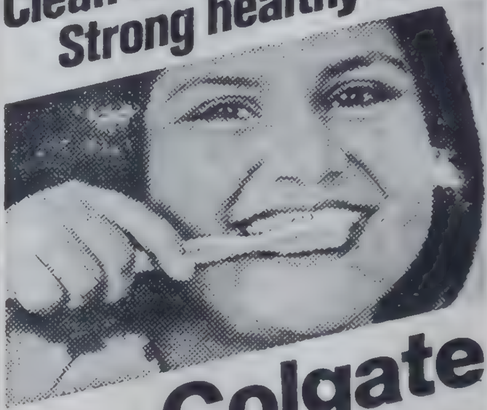

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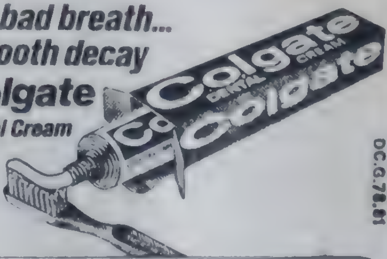

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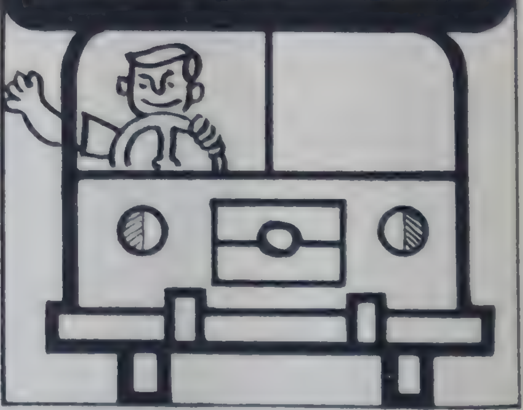

National Women's Chess

Rajanandagaon—February 1982

Jayasree Khadilkar of Maharashtra won the V.V. Sastry trophy for the National Women's Chess Championship.

Junior National Chess

Hubli—Jan. 82

Pramod Kumar Singh of Bihar retained the title in 10th Junior National Chess Championship with eight points.

Final placings with points. : P K Singh (Bihar) (8). 2. Arvind Aaron (OCCAI) (7). 3. Anup Deshmukh (Maharashtra) (7).

Sub Junior National Chess

Hyderabad—January 1983

Niraj Kumar Misra of West Bengal retained the title defeating Anup Deshmukh of Maharashtra in the final match. Niraj secured 7.5 points.

209. BOXING

Las Vegas—June 1982

Larry Holmes retained World Boxing Council (WBC) Heavy Weight title defeating Jerry Cooney.

Asian Amateur Boxing

Seoul—July 1982

South Korea became Champion of the Asian Amateur Boxing. India got the third position.

210. MOTOR RALLY

New Delhi—November 1982

Jayanth Shah of Kenya won the third Himalayan Car Rally (500 penalty points) Rudy Stall (Austria) was second and Remesh Khoda was placed third

211. BILLIARDS

World Amateur Billiards

New Delhi—November 1981

India's Michael Ferreira regained the world amateur billiards title defeating Norman Dagley of England 2725-2631

National Billiards
Madras—February 1982

Geeth Sethi 20-yr.-old student from Ahmedbad became the new and the youngest senior National Billiards Champion. In the four-member roundrobin league Sethi won by 2269 points to 1350

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PLANT TISSUE CULTURE

By

K.K.G. MENON AND S. BHASKARAN
Hindustan Lever Research Centre
Chakala, Andheri East
Bombay 400 099

INTRODUCTION

The term 'plant tissue culture' covers all types of aseptic cultures of plant origin and includes the study of isolated plant cells, of isolated plant organs such as cultures from root tips, stem tips, leaf growing points, immature parts of flowers and immature fruits. The growth of plant cells in nutrient media outside the living plant or *in vitro* was attempted by the German Botanist Haberlandt as early as 1902, but it was only in 1934 that the first successful tissue cultures of tomato roots and of callus (undifferentiated mass of cells without any organization and thus like cancer cells) were established. These pioneering studies showed that plant cells could be grown and maintained indefinitely by subculture *in vitro* and could be studied as though they were a new and vast group of micro organisms. In animal cells, long term culture is only possible in tumour or cancerous cells. Normal cells usually can be grown in culture only for a few generations after which they die out.

Apart from this remarkable achievement of obtaining cell proliferation *in vitro*, the American Scientist Steward in 1958 also demonstrated the ability to regenerate whole plants from isolated single cells. This discovery was of fundamental importance, since it is the basis for the practical applications of tissue culture. Rapid progress was made in the nutrition of plant tissue cultures by the use of media containing trace elements and supplements such as coconut milk. The discovery of hormonal regulation of growth and organ formation in plants and the developments of experimental procedures for successful culture of tissues, cell suspensions and eventually single cells leading to the *in vitro* regeneration of whole plants during the period 1955 – 1965 led to the demonstration of totipotency of higher plant cells, i.e. any part of the plant has the potential to be developed into a total plant.

In much of the earlier work on plant tissue cultures, the basic nutrient media were routinely supplemented with

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complex mixtures of natural origin (coconut milk, fruit juices, yeast extract, etc) in order to obtain optimal growth and to induce differentiation or organogenesis. The present trend is, however, towards fully defined media containing a mixture of essential macro- and microelements together with a source of carbon which is almost always a sugar and usually sucrose. Very few plant tissues can, however, be established or maintained on such a simple medium and for the majority of tissues various additives such as vitamins, amino acids, sugar alcohols and plant growth regulators are essential.

A great deal of recent interest in plant tissue culture has been worked out by the exciting developments with applications in several areas ranging from horticulture and agriculture to chemical and biochemical sciences. The stimulus to the whole field of research on tissue culture came from the discovery in 1960 that the orchids could be propagated by culturing extreme shoot tips (meristem). The cells of the small explant divided to give rise to protocorms which, in turn, could further be subdivided and cultured to develop into orchid seedlings. By this method the individual orchid could rapidly be multiplied and the progeny brought to flowering in a short period. Further the progeny was virus free. Orchid growers were the first to take advantage of this technique and presently orchids are multiplied on a commercial scale by using meristem culture technique.

Apart from rapid clonal multiplication in those plants which are difficult and time-consuming to propagate by traditional methods, tissue and cell culture techniques have potential value in areas such as:

(a) embryo culture of hybrids of desirable crosses that cannot develop due to incompatibility between the embryo and the maternal tissues;
(b) in anther culture for acceleration of conventional breeding programme, and,
(c) manipulation at cellular level enabling hybridization without sex, between protoplasts (naked cells) of unrelated species and the introduction of parts of chromosomes from one species to other species. In short, the idea of "tailor-making" new species has come closer to realization.

Clonal Propagation

In experiments leading to regeneration of whole plants, viable tissue explants removed from almost any part of a wide variety of plants are first induced to proliferate by rapid cell division activity into a fairly homogeneous mass of tissue, called callus tissue. This tissue is then cultured on nutrient media containing the appropriate amounts of growth hormones. In many cases multiple shoot differentiation can be obtained directly from the initial explant in appropriately designed nutrient media. The plantlets produced *in vitro* are then transferred very carefully and under strictly contolled conditions to soil in the green house and late in the field. It is now possible to regenerate whole plants (or produce somatic embryos) that grow into normal plants in a wide variety of species.

The advantage of using Tissue Culture techniques in the propagation of plant species is in the rapidity with which propagation can be achieved and in the large number of plants that can be produced with a saving of space and cost for propagation. Certain plant species especially those belonging to pulse group, which provide an important source of vegetable protein and are also responsible for the nitrogen enrichment of the soil through symbiosis with Rhizobia have generally failed to respond to various attempts at plant regeneration *in vitro*. While there has been some success in plant regeneration in cereals, large scale propagation has still to be demonstrated. Woody or tree species have been uniformly difficult to cultivate *in vitro*. However, recent reports of plant formation in tissue cultures of some of the important timber species such as teak, douglas fir, spruce, poplar, pine etc. are encouraging further intensive efforts in this direction. Forest trees are the raw materials for wood and wood products. The world demand for wood and wood products is estimated to double by the year 2000 A.D. The present day tree improvement programmes are not adequate to meet the growing demand. Trees of improved quality are needed. Tissue culture seems to offer an alternative approach to these problems. Any exercise which promises an increase in the yield of even 2—5% is well worth the cost.

Plants produced asexually through organogenesis in Tissue Culture are genetically identical and can be produced much more rapidly than is possible through sexual reproduction. It has been observed that some of the plants produced through this technique grow faster and mature earlier than seed propagated plants. There is virtually no limit to the number of plants that can be produced by this procedure. A million-

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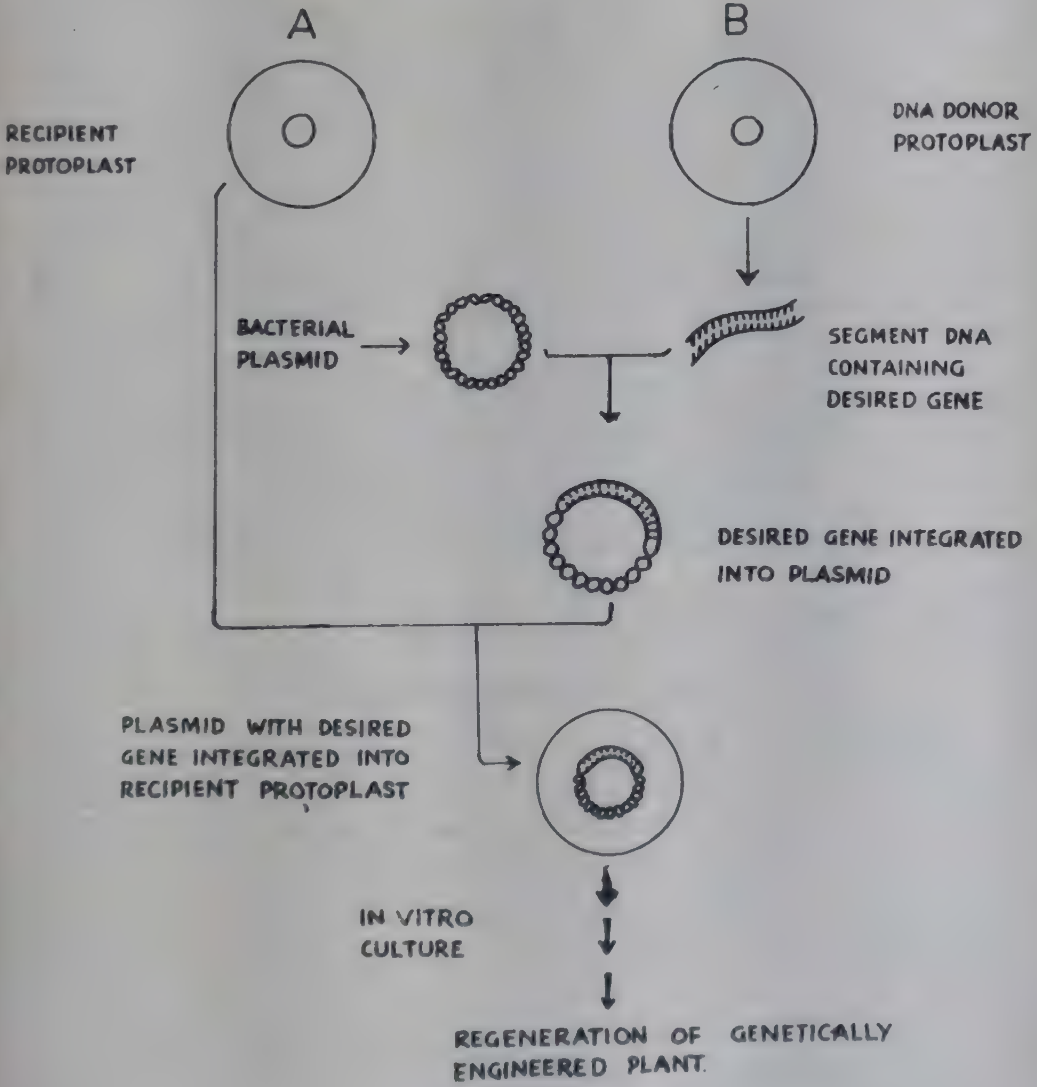
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fold increase per year in the rate of clonal multiplication over conventional methods is not unrealistic. These highly favourable characteristics of clonal propagation *in vitro* have naturally attracted the attention of horticulturists, foresters and plant breeders. There are now many commercial nurseries and other industry supporting laboratories in U.S.A., Europe and elsewhere which produce many of their plants for commercial use by Tissue Culture techniques. Some extremely important work has already been done in oil palms. Clonal plants in oil palms were actually produced from seedling meristems and then planted in Malaysia. In our own country, Tissue Culture techniques have been applied to raise plantlets in large numbers from some economically very important plant species such as teak, sandalwood, eucalyptus, citrus and a number of horticulturally important species. The "test tube trees" of eucalyptus and teak have been transferred to field conditions and they are growing very well. In the literature of plant tissue culture, this is an excellent demonstration of transferring "Tissue Culture Technology" from the laboratory to "applied field conditions".

Conventional methods of propagation such as cuttings and grafts have great advantages, especially when the characteristics of plants grown from the seeds of a single plant are found to vary or in the case of many hybrids where no viable seed is produced but it is possible to produce only a small number of plants by using conventional methods of cuttings and graftings. If a large number of plants can be produced through tissue culture from one selected plant it would pave the way for improving the yield and quality of many crops, especially in the tree crops, such as coconut where breeding cycles are long and vegetative propagation is difficult or impossible.

Pathogen Free Plants Through Tissue Culture

In vegetatively propagated plants, once systemically infected with a viral disease, the pathogen passes from one vegetative generation to the next. The entire population of a given variety may, over years, be infected with the same pathogen. Especially, with latent viruses, the symptoms are hardly detectable but the yield and/or the quality of the crop decreases gradually over generations, e.g. in potato the yield losses reported on various cultivars due to virus infection range from 10%—60%. It is likely that all clonal crops cultivated today are harbouring one or more viral diseases. Because of the rising human standards of living and increasing population size, it is not worth while to grow a crop which gives a return below its potential value due to the presence of the pathogen. In order to ensure the highest possible yield and quality, virus free stock plants should be provided to the farmers on a yearly basis. To date there is no chemical or physical treatment which can effectively eradicate viruses from infected plants. Tissue culture has become the principal technique for obtaining virus free plants from a generally infected population.

It has been found that the shoot and root apical regions (the growing point) of virus infected plants are frequently devoid of viral particles. It has also been noted that callus tissues derived from virus infected plants contain a high percentage of healthy cells. Shoot meristems and callus cultures become attractive sources for regenerating virus free plants from infected population. These tissue culture methods can also be used for the production of pathogen free plants infected with pathogens other than viruses such as mycoplasma, fungi and bacteria. The value of this method to the horticultural industry, therefore, is immeasurable.

Meristem cultures involve the dissection of a portion of the stem tip and culturing it on a nutrient medium for plantlet regeneration. Plants derived from meristem cultures are also genetically identical to the parent.

Employing this technique, virus free plants of a large number of species have been obtained, e.g. pineapple, yams, banana, tapioca, apple, sugarcane, pea, tobacco, potato, ginger as well as a number of Ornamental plants.

With the *in vitro* meristem culture technique, an impressive number of clonal crops have been freed from systemic viral infections. Some of these virus free clones have already been cultivated by the growers on a commercial scale. Simultaneously these techniques may not only eradicate viral diseases from infected clones but also free clonal crops from systemic infections by mycoplasma. The movements of mycoplasma in the host plant body resemble those of viruses. With the demonstrated improvments in crop quality and yield when virus free clones are used, and with the increasing popularity of plant tissue cultures in recent years, more and more of scientists all over the world are devoting their efforts to the *in vitro* regeneration of pathogen free crop plants. The number of pathogen

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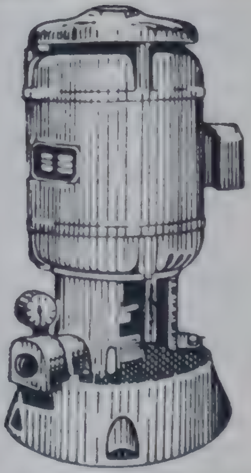

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free clonal plants is, therefore, expected to increase at an accelerated rate.

Embryo Culture

This technique — one of the simplest of tissue and cell culture techniques — has a particular value when distant hybridisation (inter-specific and inter-generic) is involved. In some cases of attempted hybridisation, collapse of endosperm is responsible for seed abortion, which means the attempted hybridisation is unsuccessful. However, *in vitro,* cultivation of immature embryos can be used to overcome endosperm collapse, thus allowing the development of hybrids. Promising results, mostly in crosses between cultivated and wild related species, have been obtained with this technique among cereal crops e.g. crosses among cultivated wheats and related genera; crosses of cultivated rice with other species and crosses among different species of jowar, bajra, maize, barley, cotton and oil seed crops.

An additional advantage that has been derived from embryo culture in some species is the shortening of juvenile stage. This has been amply demonstrated in orchids and is now commercially exploited for fruit trees such as apple, pear, and citrus. It could also be used for starch producing palms (in sago palm the juvenile stage is of 8/9 years duration). Moreover, in some plantation crops like coconut and oil palm, detachment of ovules from the inflorescense allows them to be fertilised *in vitro*. In this way many more individuals could be obtained than from normal seed-nut production. Larger numbers of plants could thus be derived from a single, selected interesting individual plant. This technique could also provide a very economical and safe procedure for exchange of tested or disease free germplasm.

Anther and Pollen Culture

We have seen that plantlets in large numbers can be regenerated from body cells of a plant irrespective of their origin i.e. whether they are derived from leaf, stem, root etc. All these cells have double copy genetic information or two sets of chromosomes and, therefore are called diploids.

The dividing nuclei of a particular species possess a characteristic number of chromosomes. In addition, an essential factor in both plant and animal fertilisation is the fusion of gametic nuclei of paternal and maternal origin. It follows, therefore, that there must be a mechanism by which the chromosome number is reduced to half in germ cells to compensate for the increase potentially brought about through fertilisation. Reduction division or meiosis has been found to exist in those organisms which propagate by sexual reproduction. In plants, the female germ cells are called 'egg cells' and the male generative cells are termed 'pollen grains'. Pollen is produced in large numbers in a sac—like organ called anther. The contribution of each parent is, therefore, a single or haploid set of chromosomes, to provide the zygote with a double or diploid set. Is it possible to exploit the unique genetic potential of pollen grains by producing whole plants carrying only single copy genetic information? In nature haploid plants are of very rare occurrence. Plant scientists have, therefore, wished for long for a dependable method of producing haploids at will.

The first successful culture to obtain haploid plantlets was made in India in 1964 by Guha and Maheshwari in datura Two principal methods are now available for the production of haploids. anther culture and pollen culture. In anther culture, unopened flower buds containing anthers of appropriate stage are surface sterilized and the anthers plated immediately on to an appropriate medium solidified with agar. They may also be floated on the surface of liquid media or supported on filter paper bridges over liquid media. Pollens contained in the anthers give rise to 'embryos' which develop through stages like those of the true zygotic embryos to form plantlets. When a large number of plantlets are produced in one anther, it is necessary to separate them very soon after the anther opens. At this early stage, the plantlets can be readily teased apart and transplanted individually in fresh culture media. When the plantlets have developed an adequate root system, they may be potted in compost or a mixture of peat and sand. Freshly potted plantlets are then kept preferably in a mist propagator for a few days until the roots get established.

Under certain other cultural conditions, the pollen may develop into a callus which on transfer to appropriate medium will undergo organogenesis i.e. will form roots and shoots. At maturity, plants of callus origin are phenotypically indistinguishable from plants derived directly from the pollen. Pollens of crop plants such as wheat and rice usually develop wholly as callus whereas pollens of datura, tobacco etc give rise to 'embryos'

In pollen culture, anthers from sterilized buds are ground in a suitable homo

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genizer containing liquid culture medium. After separating the anther wall debris by centrifugation, the pollen grains are cultured directly. Since each pollen grain is capable of giving rise to a plantlet, it is possible to obtain thousands of plantlets from one anther.

There are a number of advantages in crop improvement programme if haploids are available in large numbers. For example, haploids offer a great advantage over diploids for isolation of mutants.

One of the techniques in the improvement of plants is through induction of mutation following irradiation of seeds with x-rays, gamma rays or by treating the seeds with certain chemical mutagens. Since the embryo is a diploid tissue, isolation of mutants will be possible at the earliest in the second generation. This is because most of the mutations are of recessive type and for their expression it is necessary that the induced mutation is in a homozygous condition. Because of the presence of only single copy genes in haploids, mutants can be isolated in the first generation itself. Another advantage is in the production of homozygous diploids by doubling the chromosome number. The chromosome doubling can be achieved by treating young haploid plantlets with a chemical called colchicine. Normally in a diploid organism the pairs of genes present on chromosomes are derived from two parents and thus need not be identical, and are, therefore, heterozygous. Through inbreeding of pollen derived diploid plants, it will be possible to produce pure lines which have applications in hybrid seed production. Utilizing pollen derived haploids, disease resistant and high yielding varieties of rice, wheat and tobacco have already been released in China and other countries.

Tissue Culture of Medicinal Plants

Many of the substances used in the pharmaceutical, food flavour and perfume industry originate from plants, and although, the trend over the last 50 years has been towards chemical synthesis, plants still remain an important source of many of these compounds. Many compounds are still difficult or costly to synthesize.

The success of the fermentation industry in harnessing microorganisms to produce desired chemicals in abundance provided an attractive precedence for the plant cell and tissue culturists. It was found that compounds of medicinal interest are indeed produced by cultured cells or tissue of some plant species

Plant tissue cultures have been shown to synthesize anti-tumour alkaloids, amino acids, proteins, antibiotics, fatty acids, various enzymes, steroids precursors etc. which are of immense use in pharmaceutical industry. Attention also has been paid to the production from plant tissue cultures of colouring agents, condiments, perfumes, insecticides, insulin like compounds and vitamins.

The amount of compounds like diosgenin, nicotine etc. from tissue cultures has approached or exceeded that in the plant. Even new compounds, which are not synthesized in the intact plant are produced by cells in culture.

However, the need of greater knowledge and technology for profitable plant tissue culture has not yet been completely satisfied. But, it is obvious that the present cost restraint associated with plant tissue culture fermentation would be significantly reduced if a desired product was produced in an adequate amount in a reasonable time and at a low operational cost. Some of these requirements for commercial application have to some extent been satisfied. By the selection of high yielding clones and by modifications to the culture environment and medium the yields of a number of species have been increased to or even above that of the parent plant.

Biosynthetic capability of cultured cells could be improved by the artificial induction of genetic mutation. Many mutant clones of carrot cells have been isolated which varied widely in their capabilities to synthesize carotene and lycopene. The carotenoid content in one of the improved clones was increased nearly three-fold in comparison with the original strain and it was about four times higher than the carotenoid content in the intact root. The frequency of obtaining mutant cells may be markedly increased by mutagen treatment of haploid cells. But there has been little work on the artificial induction of mutant cells useful for medicinal compound production. Mutation research on plant cell cultures should be a major concern for the future.

There are various reasons for using plant cell cultures for the production of secondary products. It seems safe to foresee a period of many years of extensive research in this area to the benefit of both basic research and the use of cultured plant cells for medicinal/pharmaceutical purposes.

Genetic Modification of Plants

Till recently, the backbone of plant breeding has been genetic recombination and selection. Apart from the introduction of mutation breeding technique about

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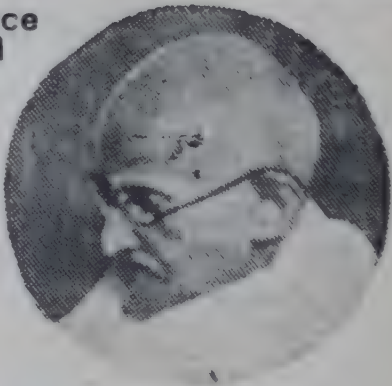

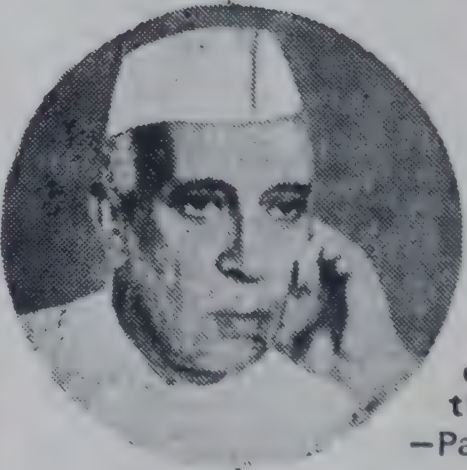

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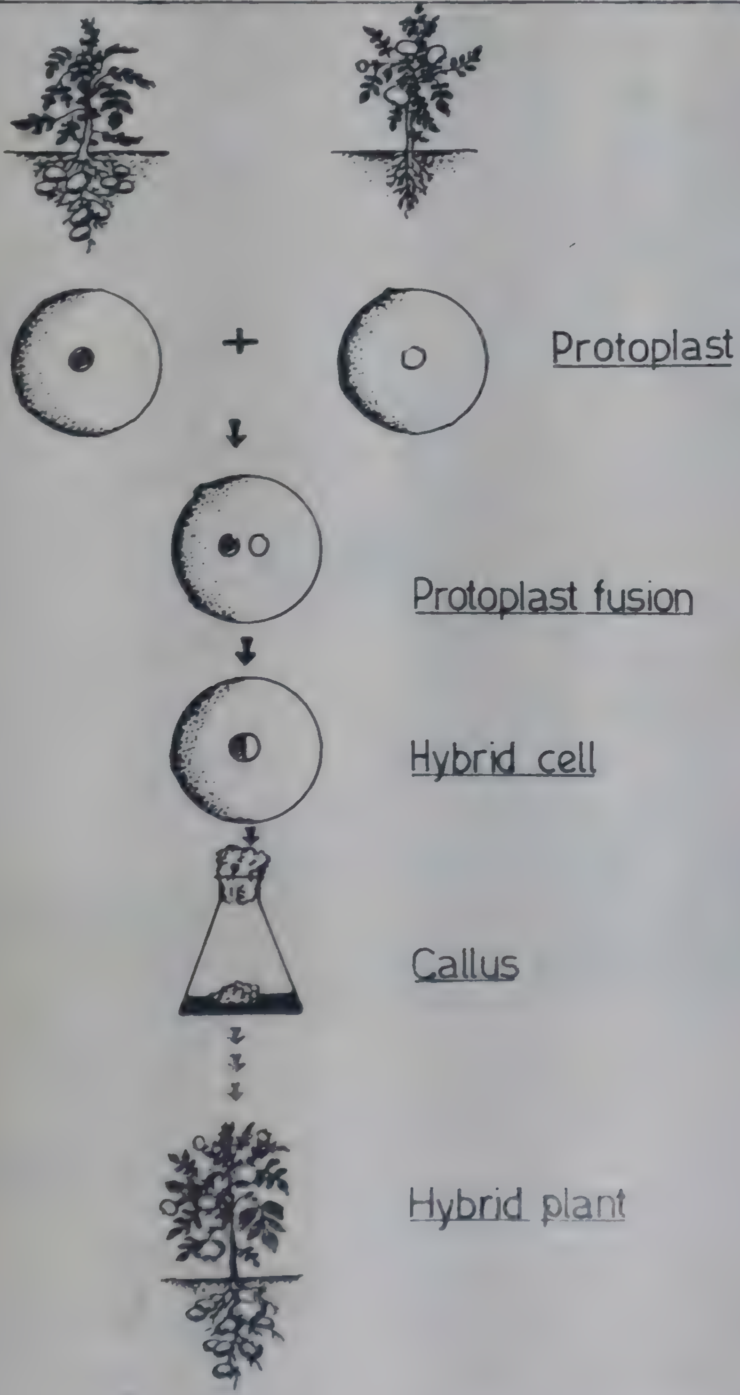

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25 years ago, plant breeders have had to rely solely on sexual processes and genetic recombination to introduce the characters for which they can select. These methods have been highly successful as is evident by the improvements in yields, quality and disease and pest resistance of crops. However, there are limitations to the classical methods, the main one being that due to sexual incompatibility, it is not possible to introduce desired genes. In order to evolve efficient crop plants that can meet the production and quality requirement of the future, it is imperative to incorporate characters from organisms that are beyond the barriers of sexual compatibility which is unattainable through conventional breeding procedures. Parasexual genetic manipulations through the protoplast technology, that have developed especially over the last decade, hold considerable promise in this direction. Unlike animal cells which are surrounded by a permeable membrane, plant cells have a dense wall. This wall must be dissolved in the culture leaving only the naked cell or protoplast that can be then fused with other protoplasts. It is possible now to produce protoplasts *en masse* from various tissues of most of the plant species. The cell walls are dissolved by using certain cell wall degrading enzymes.

Protoplasts, i.e. cells stripped of their wall, can be cultured to regenerate whole plants; can be mutagenized to obtain useful mutants that cannot otherwise be isolated; fused to yield interspecific and intergeneric hybrids and transformed by introducing desirable genes from hitherto inaccessible sources.

Mutations at Cellular Level

The use of protoplasts in selecting mutant has many attractions. First, it offers the possibility of handling large populations in short space and time. Second, unlike in an organised tissue like embryo of a seed which is preferred in conventional mutation breeding as the starting material, no competition exists between mutated and nonmutated cells thus allowing full expression of the mutant. Hence it is possible to recover even very rare mutants not possible otherwise. Techniques developed for selection of mutants at cellular or protoplast level give hope of obtaining mutants which over-synthesize certain limiting amino acids such as lysine in cereals. Such mutants will be useful from the point of view of improved protein quality. Similarly mutants of economically important crops resistant to phyto-toxins, herbicides, chilling, drought and salinity would be of great agricultural interest

Cell Hybridization

Cell hybridization by means of protoplast fusion is a method increasingly applied in genetic manipulation of higher plants. Fusion of protoplasts derived from two distinct plant species can lead to three different situations: (i) Production of hybrids in which complete genetic information of both the parents is present; (ii) Transfer of partial nuclear genetic information from one species to another and (iii) Transfer of genetic information contained in organelles such as mitochondria and plastids. The method of fusion involves bringing the protoplasts derived from two plant species together using certain chemicals. In the presence of these agents, because of its pliability, the membranes of the protoplasts at the site of attachment fuse with each other, thus, forming a fused cell with two nuclei. In order to get a true hybrid, it is necessary that the nuclei which contain the complete blueprint for hereditary information also fuse. Scientists have developed techniques to achieve efficient nuclear fusion. Subsequently, on culturing the hybrid cells in appropriate nutrient media regenerate cell wall, undergo divisions and form a callus. The callus is then transferred to another medium containing an appropriate amount of plant growth regulators for differentiation i.e. formation of roots and shoots.

A number of interspecific hybrids have been obtained employing this technique. The first successful report of obtaining a hybrid between two species of tobacco was reported in 1972 by three American scientists, Carlson, Smith and Dearing.

No doubt, such a hybrid could also be obtained by conventional breeding methods; nevertheless, plant scientists hailed this achievement as a breakthrough as this technique would produce hybrids of sexually incompatible plant species. This was followed by a flurry of activity among scientists round the world and led to the production of about a dozen hybrids, between sexually incompatible species. An example of such a hybrid produced is of potato and tomato. The expected result, however, of harvesting both potato and tomato from the same plant has not been realized yet. With further refinement in the techniques, scientists are hopeful of removing factors that hamper the normal development of the hybrid plant from which both tomato and potato could be harvested. In future, it should be possible to hybridize any two species, bypassing sex

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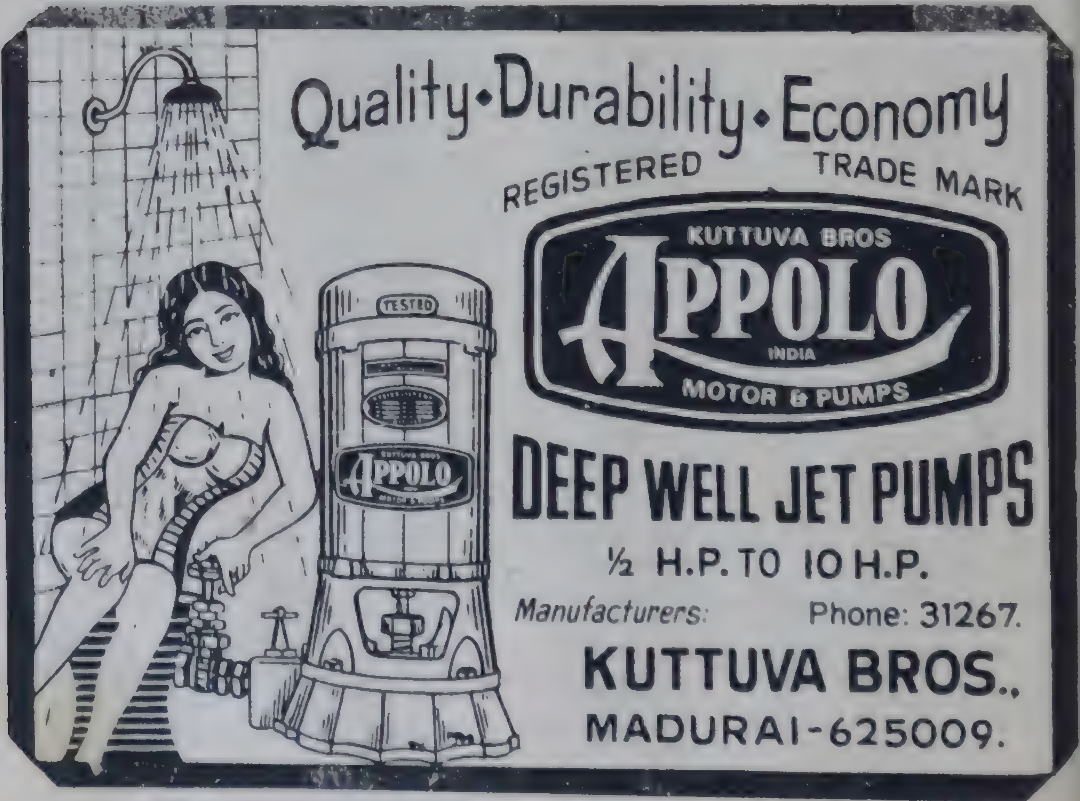

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Partial Cell Hybrids

Sometimes when such a hybrid is made, there is spontaneous elimination of chromosomes of either of the species. With elimination of chromosomes in successive cell generations, it will be possible to recover hybrids which contain full complement of chromosomes from one species and one or a few chromosomes from the other species. This phenomenon of chromosome elimination is not confined only to plant systems. In fact, chromosome elimination was first observed in man-mouse cell hybrids.

Stabilization of only one or a few chromosomes, from one of the parents in cell hybrids following chromosome elimination is actually desirable because the purpose of cell hybridization involving distantly related or unrelated plant species is not to combine all the traits from both the species but only a few desirable traits from one species with the other. Although the chromosome elimination is a random process, cell hybrids having a particular chromosome can be recovered using special selection techniques. For example, it may be possible to transfer selectively drought and disease resistance from barley to wheat without affecting all other qualities of the latter.

In those cases where there is no spontaneous elimination of chromosomes of one of the species, it is possible to eliminate most of the chromosomes of one of the species by inactivating its chromosomes after irradiation with X-rays. Such irradiated protoplasts are then fused with unirradiated protoplasts of other parent which will allow retention of all the chromosomes of one with one or a few chromosomes of the other.

Cytoplasmic Hybrids

For hybrid seed production commercially in a crop, it is necessary to develop male sterile lines. The factors for male sterility reside not in the nuclei but in the cytoplasm. Through conventional breeding procedure, the time taken to develop such lines is about 8 – 10 years. This long period of developing male sterile lines can be telescoped employing modern techniques of cell cultures which involve fusion of anucleated protoplasts of a male sterile line with nucleated protoplasts of a species in which this trait is to be transferred. Anucleated protoplasts can be obtained by destroying the nucleus after exposing it to heavy doses of radiations (X – or Gamma – rays) or by chemical treatments. Within a short period of development of this technique, male sterile lines of tobacco and of an ornamental plant have been produced. Similarly, it should be possible to produce male sterile lines in economically important crops such as cereals, pulses, vegetables etc. Success in this direction is bound to make a very positive dent in the food production as most of the hybrids outyield the parental varieties.

Genetic Engineering

Deoxyribonuclic acid (DNA) is the genetic material in almost all living organisms. The blue-print for all traits reside in this giant molecule in the form of very precise codes. The living cell has the necessary machinery for deciphering this code at appropriate times during development. A segment of DNA in which precise sequence of codes reside is called a gene. In other words, a gene or a couple of genes will determine a specific trait such as height, disease resistance or susceptibility, yield attributes, colour of the fruit etc. It will, therefore, be attractive to introduce a desired gene responsible for a specific trait from a species into another in which it is lacking.

Two approaches are being tried to achieve this goal. First, isolation of the segment of DNA harbouring the desired gene and directly introducing it into the protoplast and second, using a vehicle like a bacterial plasmid to carry the isolated gene to a plant cell for incorporation and integration in its nucleus. Since the protoplasts are totipotent, plants can be regenerated with new information introduced in them.

Of these two possibilities, plasmid mediated transfer of alien DNA is more promising than direct insertion of DNA into the host cell. Tremendous progress has been made in manipulating the genetic material of lower forms of life, such as bacteria, with the discovery of certain enzymes, which the scientists can use as scissors to cut the DNA at any desired site of the molecule. The plasmids are being used as vehicles because of the ease with which they can be taken out of the bacteria for insertion of a particular gene and reintroduced into the recipient plant cell.

Progress in this technology promises to introduce nitrogen fixing genes into food crops like rice, wheat, maize, barley and other crops. Modern agricultural production is heavily dependent on chemical fertilizer application. However, these are getting scarce and costly and soon will be beyond the reach of the farmer. Pulses are the only group of plants that have the property of utilizing the nitrogen fixed by certain types of bacteria which

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live in close association with the host plant. To meet the increasing demands of food on this planet, it becomes imperative, therefore, that the nitrogen fixing ability is conferred to non-legumenous plants also.

Conclusions

Once the *in vitro* technology is perfected, farmers anywhere in the world will have available plants that have been tailored to grow in their particular environment. Using the perfected technique, plant scientists would be able to introduce desirable characteristics such as nitrogen fixing ability, disease and drought resistance or cold hardiness into plants which did not previously possess these characteristics. The technique would speed up the normally slow process of conventional hybridization and eliminate the guess work inherent in open pollination. Most significantly, the new tool could lead to the creation of new "super plants". If rice or wheat, for example, can be programmed to fix their own nitrogen, i.e. take nitrogen from the air and convert it to fertilizer in the form of ammonia as do legumes and certain bacteria, the large quantities of commercial fertilizer now required by farmers would be significantly reduced.

GLOSSARY

Aseptic: Free from bacteria and fungi.

Carotene: A yellow pigment present in carrots. Converted into vitamin in the animals. Carotene acts as a photosynthetic pigment in plant cells which lack clorophyll.

Chromosomes: Thread like bodies that occur in the nuclei of living cells, the molecules of which carry genetic code.

Clone: The descendants produced vegetatively from a single plant.

Culture: Growth of tissue or cells in an artificial medium outside the living plant.

Cytoplasm: All the protoplasm of a cell excluding the nucleus. it is usually a transparent gel or viscous fluid with the cell organelles.

Diploid: A cell in which the nucleus contains chromosomes *in pairs.*

Endosperm: The part of the seed which gives nutrition to growing embryo and seedling.

Explant: Segment of a plant; e.g. leaf, stem root, etc.

Gamete: Germ cell. A reproductive cell usually haploid and sexually differentiated. The female gamete unites with the male gamete during fertilization to produce a zygote which develops into a new individual.

Genesis: Origin

Haploid: Having a set of single (Unpaired) chromosomes.

Heterozygous: An individual having dissimilar copies of genes on a pair of chromosomes.

Homozygous: An individual having identical copies of genes on a pair of chromosomes.

Infection: A disease or other harmful condition resulting from an invasion by injurious organisms, eg. bacteria, fungi and virus.

In vitro: Applied to biological processes when they are experimentally made to occur in isolation from the whole organism.

Intergeneric hybrids: Plants or animals resulting from a cross between parents that are genetically unlike and belong to two different kinds of groups used in classifying organisms.

Meristem: Growing tip of stem, root, leaf, etc.

Meiosis: A process of cell division as a result of which a diploid cell, produces four haploid cells. Meiosis occurs in the life cycle of all sexually reproducing organisms.

Mitochondria: Munute rod shaped or granular bodies which occur in the cytoplasm of most cells. Mitochondria are the power houses of the cells.

Mutagen: A substance which produces a mutation.

Mutant: An organism, the cells of which carry a mutation.

Mutation: A change in the chemical constitution of the chromosomes of an organism. The changes are normally restricted to individual genes, but occasionally involve serious alteration to whole chromosomes.

Mycoplasma: Smallest free living micro organisms lacking cell wall and variable in form. Shown to cause certain plant diseases.

Organelle: A persistent structure with specialized function forming part of the cell eg. mitochondria and plastids. An organelle in a cell is analogous to an organ in the whole organism

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Ovule: That part of flower which develops to form a seed after fertilization.

Parasexual: A method of hybrid cell formation without involving sexual process, eg. fusion of two naked cells (protoplasts).

Pathogen: Any disease producing bacterium or micro-organism.

Phenotype: The characteristics possessed by an individual organism as a result of the interaction of its inherited characteristics with its environment.

Plasmid: Genetic element existing and replicating autonomously in the cytoplasm of cells, either artificially induced or natural.

Plastids (Chloroplasts): Lens shaped structures in the cytoplasm of a plant cell containing a green pigment (chlorophyll) which absorbs energy from sun light enabling them to synthesize food from atmospheric carbon dioxide and water.

Propagation: To reproduce itself, as a species of plant or animal.

Protoplast. A naked plant cell in which the outer cell wall has been removed. The protoplast contain all the organelles as are present in the intact cells.

Recombination: A genetic phenomenon and refers to a new combination of genes.

Rhizobia: A strain of bacteria which fixes atmospheric nitrogen in association with a host plant—usually belonging to the Bean family.

Somatic: Pertaining to the body. Somatic cells are the cells of which the body of an organism is constructed as opposed to the reproductive or germ cells.

Symbiosis: Association of two dissimilar organisms for mutual benefit.

Titipotency: The ability to regenerate complete plants from isolated single cells.

Toxin: Poisonous substances produced by certain bacteria.

Vegetative: Pertaining to some part of the plant body distinct from spore

Zygote: The product of the union of two gametes.

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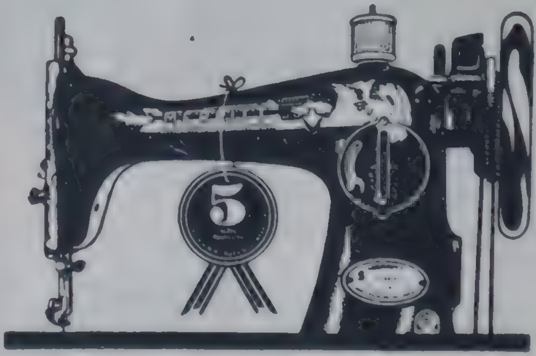

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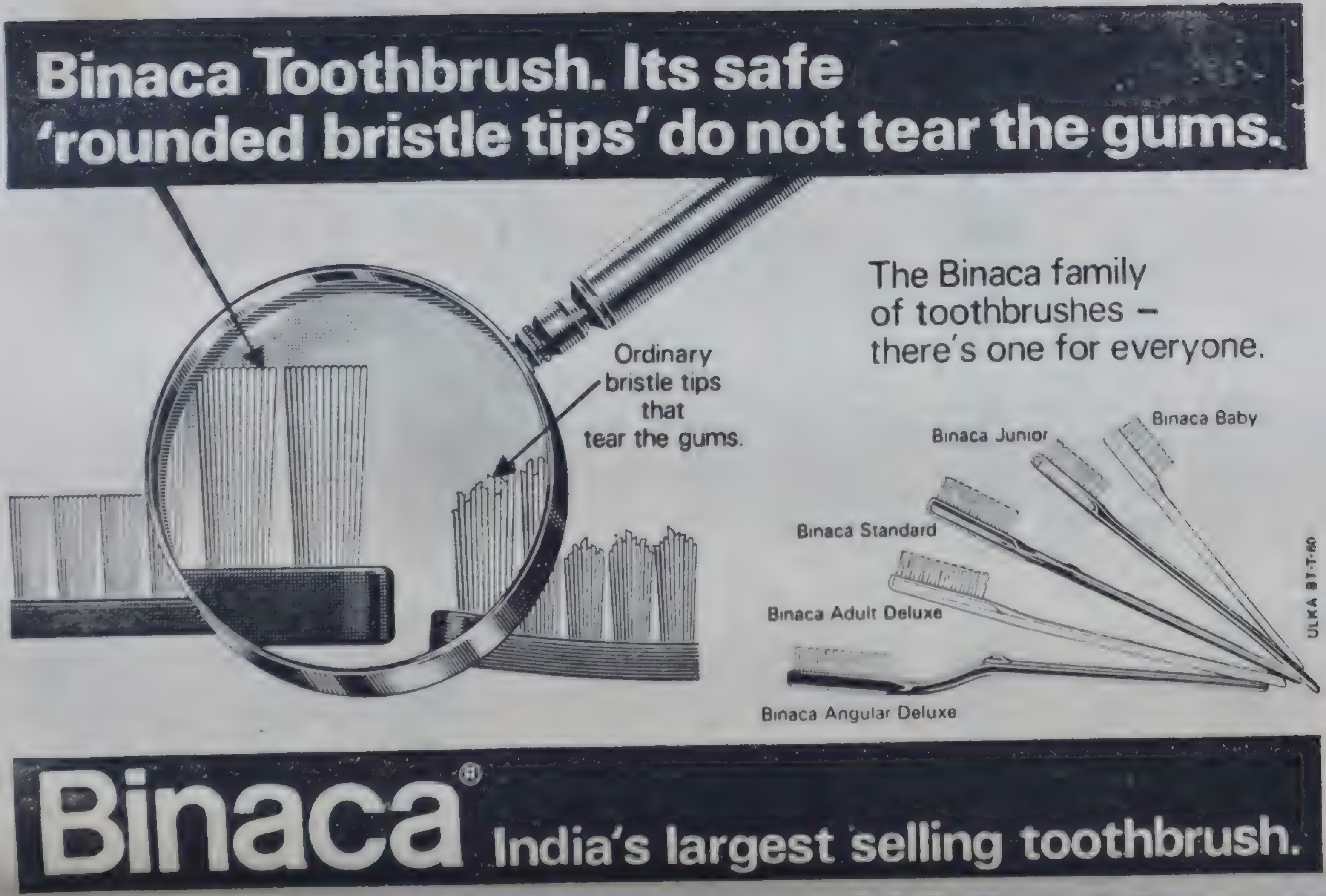

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Note: *Some Sections the Contents of which are arranged in the alphabetical or chronological order are not included herein, notably, Classical writers, Countries of the World, Major Events of History, Landmarks of Indian History, Landmarks of Science and Milestones of Medicine.*

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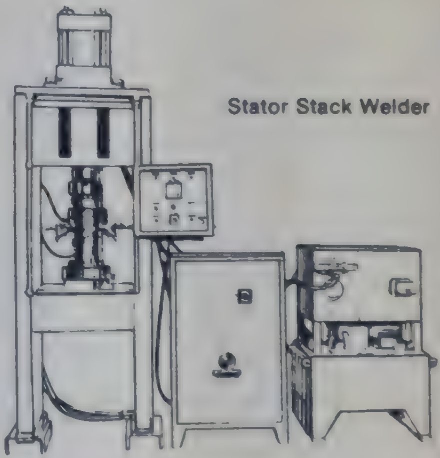

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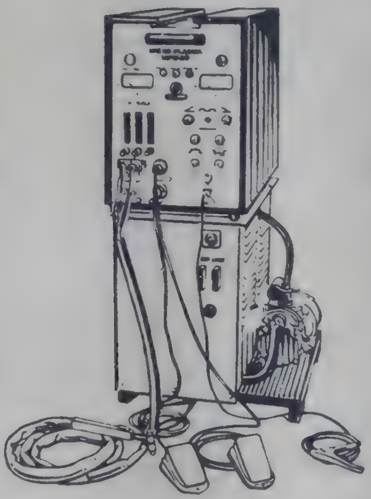

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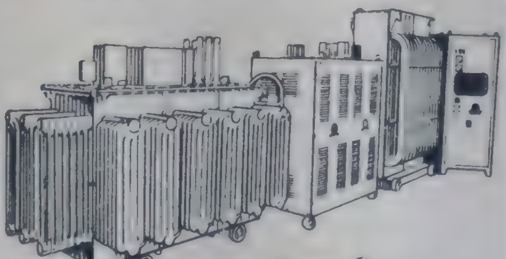

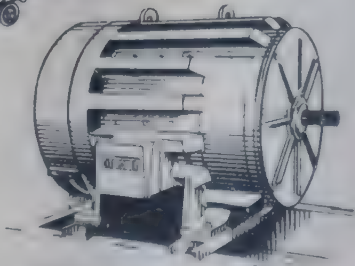

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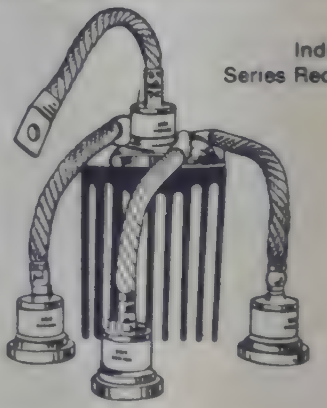

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When Atul started out in
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The Atul township is a model of integrated development: With its own Railway Station, Open Air Theatre, Community Centre, Panchayat, Consumer Co-operative and fire fighting services. With over one lakh trees planted to preserve the ecological balance. With modern housing facilities and subsidised amenities. Atul has indeed changed the face of South Gujarat!

Atul has also continuously extended patronage to educational, philanthrophic and national causes. Recently Atul launched a rural and community development programme in fulfillment of its motto: 'Industry is for the People.'

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